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WORLD SWORDFISH FISHERIES

Volume V.

North America

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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WORLD SWORDFISH FISHERIES

An Analysis of Swordfish Fisheries, Market Trends, and Trade Patterns
Past-Present-Future

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Volume V.

North America

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Silver Spring, Maryland

NOTES

The authors have used statistical data collected by the International Commission for the Conservation of Atlantic Tunas (ICCAT) in Madrid and the Food and Agriculture Organization (FAO) of the United Nations in Rome as the primary sources for their statistical data. Unfortunately, that data does not always match perfectly and some discrepancies exist. In addition, ICCAT and FAO data frequently do not agree with information supplied by various countries. The authors have, for example, press clippings showing landings of swordfish by countries whose landing statistics show "no landings" in both ICCAT and FAO catch statistics. The authors believe that these instances are rare, but they do suggest that readers allow for modest adjustments to figures cited in the report.

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I.

OVERVIEW

The North American fishery for swordfish includes Canada, Greenland, and the United States. Greenland is a minimal player catching only a small quantity of individual swordfish on an irregular basis. Canada, by contrast, ranks among the world's top ten producers of swordfish. Almost all of the Canadian harvest of swordfish (1,610 tons in 1995) is harvested in the northwestern Atlantic Ocean and is exported to the United States. The United States ranked as the world's fourth largest producer of swordfish in 1995, with an estimated catch of 5,916 tons.[1] The United States catches swordfish both in the Atlantic and Pacific Oceans. Canada and the United States are both members of the International Commission for the Conservation of Atlantic Tunas (ICCAT) while Greenland is not. ICCAT is an international organization whose members work to manage stocks of tuna and tuna-like species throughout the Atlantic Ocean.

The total harvest of swordfish by all countries in the North Atlantic Ocean (Spain, Canada, Portugal, the United States, France, Japan and Bermuda) amounted to 9,559 tons in 1995. Canadian and U.S. east coast fishermen caught 2,825 tons in the North Atlantic Ocean. United States fishermen also caught 1,270 tons in the western central Atlantic Ocean, 22 tons in the northeastern Pacific Ocean and 3,409 tons in the southwestern Pacific Ocean for a total of 5,916 tons. The value of the total U.S. catch of swordfish (Atlantic and Pacific) of 5,916 tons was worth $37.3 million (ex-vessel) in 1995. U.S. seafood producers processed 2,920 tons of fresh and frozen fillets worth $36 million and 1,629 tons of steaks worth $16.9 million in 1995.[2]

Longlining is currently the primary method of harvesting swordfish in Canada. The fishery was very active in the 1960s when a record 6,888 tons was harvested. The sale of swordfish was banned in 1971 when it was discovered that mercury levels in most swordfish caught off Nova Scotia exceeded Health and Welfare Canada guidelines.[3] The ban on sales was lifted in 1979 and harvests resumed their steady growth. In 1994, the longline harvest amounted to 1,654 tons out of a total of 1,676 tons landed by Canadian fishermen. This harvest declined to 1,409 tons out of 1,610 tons caught in 1995. Harpooning takes place when the swordfish is resting on the surface after feeding.

In the United States swordfish fishing began as a harpoon fishery. Today the majority of swordfish are caught with longlines. There were at least 1,531 commercially permitted swordfish vessels operating in U.S. waters in 1995. Most of these are longline vessels. Approximately 300 Atlantic permitted vessels catch at least one swordfish each year. Most of these vessels are owned by individual entities. In California, the harpoon fishery began in the 1900s. In 1980 there were over 1,200 harpoon permits. Of these fewer than 300 vessels land harpooned swordfish annually. California also has an active driftnet fishery. Longlining in California did not begin until 1993. In Hawaii, longlining for tuna began in the early 1900s, but swordfish longlining did not begin until the 1980s. As on the Atlantic, most of the vessels are owned by individual entities.

II.

COUNTRY REPORTS

1

CANADA

William B. Folsom and Dale M. Crory

Canadian fishermen have been catching swordfish since the 1930's. In the 1960's, however, the fishery expanded dramatically as longline gear replaced harpoons. Landings declined sharply in the early 1970's because of U.S. mercury restrictions. In 1977, the Canadian Government decided to stimulate the industry through the issuance of new licenses and the fishery has since grown into a multi-million dollar export industry. In 1995, Canadian fishermen caught 1,610 tons of swordfish. Almost all of Canada's swordfish is immediately exported to the United States. Canada is an active member of ICCAT.

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Fishing grounds

Canada is the second largest country in the world, covering an area of slightly less than 10 million square kilometers (km). Canada's coastline of 244,000 km ranks among the world's largest and opens onto what was once some of the world's richest fishing grounds. Canadian swordfish grounds exist in the Western Atlantic Ocean and extend from the Grand Banks, past the Scotian Shelf, to Georges Bank.[4] The most productive region is along the edge of the Continental Shelf off the coast of Nova Scotia.[5] Some Canadian fishermen have recently sought fishing opportunities in distant waters off Uruguay.

Fleet

There were 76 fishermen licensed to fish for swordfish in Canada in 1994 and 77 licensed to fish in 1995. Of the 1995 total, 66 were based in the Scotia-Fundy region and 11 were based in Newfoundland.[6] This was substantially more than the 53 active longline licenses in 1991, along with one offshore license issued for non-regulated tunas with a swordfish by-catch provision of 60 tons.[7] The increased activity in the Canadian swordfish fishery is attributed mainly to the closure of groundfish fisheries (i.e., fleet re-deployment).[8] In addition, 400 fishermen are eligible for harpoon licenses although only 97 of these fishermen landed fish in 1995.[9]

Shipyards

There are many shipyards in the Maritime Provinces of Canada which produce inshore vessels for individual fishermen. Longliners and harpoon vessels are relatively small and can be easily built and maintained by smaller shipyards.

Fleet operations and gear

Swordfish normally is found in Canadian waters from June to November when the surface water temperatures are near 60 F, although it can also be found in slightly cooler waters (down to 50 F). At this time it can be found along the Continental Shelf as it hunts for food.[10] Swordfish eat herring, mackerel, butterfish, silver hake, rat-tails, and squid; all are common to Atlantic Canada's waters.[11]

A. Longlining

Longlining is currently the primary method of harvesting swordfish in Canada. The fishery was very active in the 1960s when a record 6,888 tons was harvested. The sale of swordfish was banned in 1971 when it was discovered that mercury levels in most swordfish caught off Nova Scotia exceeded Health and Welfare Canada guidelines.[12] The ban on sales was lifted in 1979 and harvests resumed their steady growth. In 1994, the longline harvest amounted to 1,654 tons out of a total of 1,676 tons landed by Canadian fishermen. This harvest declined to 1,409 tons out of 1,610 tons caught in 1995. See table 1 for details.

Canadian fishermen use longlines with individual, baited hooks that are attached to a monofilament backline that is attached to buoys near the surface. The gear is "set" during the evening hours and is usually hauled back in the morning. Between 8 and 14 "sets" are made during a fishing trip.[13] Fishing takes place from late May or early June of each year and runs through the fall of the year.

B. Harpooning

Harpooning takes place when the swordfish is resting on the surface after feeding. Generally, large female swordfishes are most commonly found on the surface. Their habit of swimming on the surface with the dorsal and caudal fins showing allows the fishermen to see them and to approach the fish. The fishermen throw a harpoon when the boat is within range of the fish.[14] In 1995, Canadian fishermen reported that the thermocline had not fully developed by June-July, and that the fish were close to the surface where they could be harvested using harpoons along the edge of the Scotian Shelf.

Photo 1. CANADA--A Canadian harpoon vessel returns to it's home port at Ingonish, Cape Breton, Nova Scotia.

Harpooning was popular in the early 1940's and 1950's, but gradually declined in importance. Canadian fishermen harpooned 1,290 tons of swordfish in 1950 and 2,328 tons of swordfish in 1960.[15] The fishery, however, then declined until 1970 when swordfish fishing was halted following the discovery of mercury in swordfish.[16] Following re-evaluation in 1979, the ban was lifted.[17] In 1980, the catch of swordfish using harpoons resumed, but only at a fraction of previous landings. The harpoon harvest amounted to 201 tons out of 1,610 tons reportedly landed by Canadian fishermen in 1995. Although low in comparison with the longline harvest, the 1995 harpoon harvest is significantly above the 22 tons caught in 1994. Unfortunately, large swordfish are generally caught using harpoons and these large swordfishes have a higher mercury content and are thus unsuitable for export to the United States.[18] See table 1 for details.

Catch

Canadian fishermen reportedly harvested a record 7,482 tons in 1963. This declined to 4,800 tons in 1970, and then declined sharply when it was discovered that the mercury content in swordfish exceeded Canadian guidelines.[19] The catch increased after the ban on using swordfish for human consumption was lifted in 1979. In 1987, the Canadian Government attempted to stimulate the development of this fishery through the issuance of licenses and the catch has since increased to 1,616 tons in 1995.[20] The 1995 catch was taken by longline (1,409 tons or 87 percent) with smaller quantities (201 tons or 13 percent) taken by the harpoon fishery.[21] See the statistical tables for Canada for additional information.

Ports

Swordfish fishing takes place from many small ports in Shelburne and Yarmouth Counties in Nova Scotia and at Sambro in Halifax County. Key ports include Clark's Harbour, Lockeport, Sambro, Shelbourne, Woods Harbor, and Yarmouth. The ports of Halifax and Yarmouth are large; Yarmouth offers daily ferry service to the United States for large refrigerated trucks serving the U.S. East Coast.[22] St. John's, Newfoundland is another important landing port for Canadian swordfish.

Transshipments

There are no legal transshipments of Canadian swordfish. All product is landed in Canadian ports and immediately trucked to markets along the U.S. East Coast.

Processing and products

The catch is cleaned as soon as it is hoisted aboard the vessel and is immediately stored on ice in the hold.[23] The product is usually shipped whole or in large parts, on ice, until it reaches U.S. markets where the product is cut into loins. Consumers generally are able to select loins at their supermarket counter or can request that loins be cut from a specific piece of swordfish.

Companies

As soon as a vessel reaches port, the catch of swordfish is sold to fish exporters who arrange for the fish to be shipped to markets in the United States. In 1990, there were 14 Canadian firms operating from Nova Scotia that handled swordfish including:[24]

Canus Fisheries Limited of Shelburne County, Nova Scotia.
Clearwater Fine Foods Inc. of Bedford, Nova Scotia.
Dockside Fisheries of Shelburne County, Nova Scotia.
Fisherman's market Limited of Halifax, Nova Scotia
Howard Turner Fisheries Ltd. of Guysborough Co.
Independent Seafoods Limited of Halifax, Nova Scotia
Island Marine Products Limited of Shelburne County
J.L. Mood Fisheries Limited of Shelburne County.
National Sea Products of Halifax, Nova Scotia.
Ocean Enterprises Inc. of Digby County, Nova Scotia
The Fish Basket Limited of Halifax County, Nova Scotia
W.H. Atkinson Seafood Ltd. of Shelburne Country.
W.R. Murphy Fisheries Limited of Yarmouth County.
Walkers Wharf Limited of Halifax, Nova Scotia

In 1993, a computer-generated catalog of "Canadian Fish and Seafood Exporters" listed only 9 companies handling swordfish:[25]

Cherbogue Fisheries, Ltd., Yarmouth, Nova Scotia
F. Pierce Atlantic Seafoods Ltd., Shelburne, Nova Scotia
Hickey & Sons Fisheries Ltd. St. Mary's Bay, Newfoundland
Independent Seafood Processors Assoc. of Nova Scotia,
James L. Mood Fisheries, Shelburne Country, Nova Scotia
Kenney & Ross Limited, Shelburne, Nova Scotia
Sambro Fisheries Limited, Halifax County, Nova Scotia
West Bay Seafoods Ltd, Shelburne Country, Nova Scotia

Markets

A. Domestic

Although much of the catch is exported directly to the United States some swordfish is sold in Canada. With a population of 28 million, the Canadian market is an important outlet for

Canadian fishermen. It is surprising that demand for swordfish does not generate significant sales in key Canadian cities, such as Montreal, Ottawa, or Halifax. However, Canadian authorities report that consumption of swordfish in Canada is growing; data on consumption patterns was not available as this volume was being completed.[26]

B. Trade

1) Exports

The United States is a C$1.5 billion market for the Canadian seafood industry. Almost all of Canada's landings of swordfish are shipped on ice or frozen dressed to the United States. Exports of swordfish have grown sharply since 1980 when 192 tons valued at $0.9 million were shipped across the Canadian-U.S. border to markets in Boston, New York, and elsewhere. In the early 1980s, the United States wrestled with the issue of methyl mercury in swordfish and Canadian exports to the U.S. declined to nothing. In April 1987, the U.S. established a 1.0 part-per-million (ppm) standard for swordfish. This allowed Canadian exports to the U.S. to increase. In 1993, exports reached 1,746 tons worth $18 million and then declined slightly to 1,232 tons valued at C$16 million.[27] U.S. imports of fresh swordfish from Canada amounted to 1,258 tons worth $12.1 million in 1995; this amounted to just under 42-percent of total U.S. imports of fresh swordfish valued at $28.9 million in 1995.[28] There were no imports of frozen swordfish from Canada in 1995. In 1996, U.S. imports of fresh swordfish dropped to 533 tons valued at $5,625 tons.[29]

Although the United States is a driving force behind Canadian exports, Canadian exporters are concerned that U.S. testing procedures for swordfish are "excessive and unreasonable."[30] Canadian fishermen are also concerned that inspections could become a problem if resource allocation issues between Canadian and New England swordfish fishermen intensify.[31] Most individual shipments typically involve 25,000 pounds worth $5.00 per pound, or $125,000 per shipment. If the product is rejected, it represents a fairly significant loss to a small business which sometimes is left with valuable fish to dispose of.[32] The Canadians would thus like to find a more reliable method of assuring acceptance of the product to avoid problems at the border.[33]

Canada exports very small quantities of swordfish to markets outside of the United States. Canada did, however, export four tons of fresh dressed swordfish worth $73 thousand to the United Kingdom in 1991.[34] Exports to the UK increased to two tons of fresh dressed fish worth $38 thousand and three tons of frozen swordfish worth $48 thousand in 1992.[35] There were no exports reported for 1993-95.[36] The EU market for Canadian swordfish is not considered important and is likely to remain so, unless there are problems associated with shipping Canadian products into the U.S. market.[37]

2) Imports

Canada is not known to import swordfish.

Government policies

The Department of Fisheries and Oceans (DFO) annual management plans for swordfish are based on the Canadian quota, which since the 1995 season has been established by the ICCAT and from consultations with Canadian fishermen and exporters through the Atlantic Large Pelagics Advisory Committee. The DFO plan controls fishing effort through restrictions on the issuance of fishing licenses. Conservation controls are implemented through quotas and size limitations.[38]

A. Licenses

In 1987, the Canadian Government issued 16 new fishing licenses to fishermen from Nova Scotia (10), Newfoundland (four) and Prince Edward Island (two) in an effort to promote the economic development of the fishery.[39] The Government limited the number of longline licenses in Canada's swordfish fishery to a maximum of 70 permits and established a maximum swordfish quota of 60 tons for each Canadian offshore large pelagic longline vessel.[40] There were 500 harpoon licenses issued to Canadian swordfish fishermen in 1987.[41]

B. Quotas

The Canadian Government issued its fishermen a quota of 3,500 tons for 1987. This quota was assigned to 70 fishermen in the longline fleet and included 16 new licenses as part of a program to revitalize the fishery.

Canadian fishermen were issued a 2,000-ton swordfish quota by the Government of Canada in 1991. This quota allowed longliners and harpooners to land 1,880 tons and assigned 120 tons as a bycatch for two Canadian offshore tuna fishing vessels (60 tons of bycatch each). Swordfish longline licenses and harpoon licenses are available only to fishermen who held such licenses in 1988-90; this is a management program designed to control entry into the fishery. Canadian law prohibits Canadian fishermen from using highseas pelagic driftnets.

The Canadian swordfish quota was 1,500 tons for 1995. This quota represented the first year that ICCAT set a numerical cap which regulates Canada's swordfish fishery. This included 1,340 tons made available to Canadian longline fishermen and harpooners, 150 tons to be held in reserve to cover bycatch in tuna fisheries (other than bluefin), and 10 tons for offshore vessels fishing for tunas other than bluefin. Once 75 percent of the 1,340 directed fishery for swordfish was caught, the DFO planned to temporarily close the fishery to verify total catches in order to avoid overfishing the resource.[42] Canada's swordfish quota was 1,400 tons for 1996.[43]

C. Size limitations

Canadian regulations also prohibit the taking and landing of swordfish weighing less than 25 kg. In 1994, the Canadian longline fishery had a minimum harvestable size for swordfish of 125 cm for the lower jaw fork length; this converts to 19 kg of dressed weight per fish.[44] This minimum size is consistent with the ICCAT recommendation on this issue. In 1995, ICCAT adopted a recommendation allowing members to set an alternative, smaller swordfish minimum size. Canada has expressed interest in adopting this alternative minimum size.

D. Management Plans

A copy of Canada's 1994 Atlantic Swordfish Management Plan is shown as attachment 1. In 1995, the DFO Atlantic Swordfish Management Plan identified the following management objectives:

- To harvest the available Canadian quota of 1,500 tons, at the same time ensuring that reduced quotas are not overrun.

- To minimize the catch of small fish -- less than 125 cm -- and, if possible, releasing them in a way that ensures survival.

- To minimize the by-catch of bluefin tuna.

- To provide for a by-catch in directed fisheries for bigeye, yellowfin and albacore tuna.

- To provide data collection for the purpose of quota monitoring and scientific research.[45]

In 1996, Canada expanded its dockside monitoring program (DMP) which was introduced for the swordfish longline fleet in 1995. The DMP was expanded to include the harpoon fishery for swordfish. In addition, the swordfish catch in the offshore tuna fishery was reduced from 10 tons in 1995 to five tons in 1996. Fred Mifflin, Minister of Fisheries and Oceans, announced the approval of Canada's 1996 Atlantic Swordfish Management Plan on June 4, 1996.[46]

On May 29, 1997, Fisheries and Oceans Canada announced the three-year Canadian quota for Atlantic swordfish as: 1,130 tons in 1997, 1,100 tons in 1988, and 1,070 tons in 1999. The 1997 Canadian Atlantic Swordfish fishery began on June 1, 1997.[47]

Research

The DFO and the Nova Scotia Swordfishermen's Association participated in a joint pilot tagging program during the summer of 1994.[48] The study was coordinated by DFO's St. Andrews Biological Station at St. Andrews, New Brunswick.[49] The purpose of the study was to tag undersized fish to obtain information on

migration patterns, seasonal distribution, and stock structures as well as growth and survival rates. Five fishermen agreed to tag fish, estimate the weight and the lower jaw for length, and note the date and location of capture. They would then release the fish. DFO's St. Andrews Biological Station indicated that DFO had hoped that 300 to 500-swordfish could be tagged during the 1994 season. The fishermen were trained by DFO scientists to insert the tags behind the dorsal fin. The nylon tags have a fluorescent orange streamer with an identification number, return address, and notification of a reward to the finder.[50] As of September 1996, 300 swordfish have been tagged and five have been recaptured.

The DFO conducted a swordfish longlining cruise in 1992 to collect data for age and growth studies, fecundity, morphometrics, and stomach contents. Further, collaborative studies were conducted with the Royal Ontario Museum in 1992.[51] Between 1964 and 1980, Canada tagged 294 swordfish; only 26 were recaptured, mostly within 150 miles of their release. The DFO did not conduct any tagging programs for swordfish between 1980 and 1994, focusing instead on information gained from landings.[52] There was no "Science Program" throughout most of this period.[53]

Bycatch

The bycatch in Canada's longline fishery for swordfish includes bluefin tuna, bigeye, yellowfin, and albacore tuna. To avoid catching bluefin tuna, the Canadian season for longline vessels east of longitude 60"31' began on June 19, 1995, and the area to the west of that line remained open through August 1, 1995.

International relations/joint ventures

A. Multilateral relations

As a major coastal State, it is not surprising that Canada is party to a number of multilateral fishery agreements, including ICCAT. Canada is also a member of the Northwest Atlantic Fisheries Organization (NAFO) and hosts its general secretariat in Dartmouth, Nova Scotia. NAFO plays an important role in Canadian international fisheries policy, since it has the authority to establish quotas for foreign vessels outside the Canadian EEZ in the North Atlantic. Canada also participates actively in United Nations fishing-related activities; it is a party to conventions governing the use of driftnets, and is a leading advocate of the UN agreement on straddling and highly migratory fish stocks.

Canada offers quota allocations within its EEZ to foreign fleets for species which Canadian vessels decline to harvest or because of other reasons; Japanese fishing vessels, for example, are permitted to fish for swordfish inside Canada's 200-mile EEZ. In 1989 Japanese longliners were allowed a limit of 125 tons of swordfish (not within the Canadian quota) to be taken inside the Canadian EEZ.[54] However, these allocations are not within the framework of bilateral fishing accords.[55]

In 1994, seven Nova Scotia swordfish vessels were issued licenses from the Government of Bermuda allowing them to fish for swordfish and tuna inside Bermuda's EEZ.[56] Bermudian authorities were pleased by the Canadian application because the Canadians landed their catches fresh in Bermuda and shipped them out by air. This provided business for local agents, freight-forwarders, and labor in addition to the food service business at the port of St. George.[57] The Canadians also agreed to enlist two Bermudian crews per vessel, thus teaching local fishermen the art of offshore fishing.[58] The seven vessels caught about 12 tons of swordfish (and about 3.5 tons of bluefin tuna) before the Government of Canada halted the operation.[59] The fishermen were later fined for fishing without a Canadian license. The Canadian Government indicated it would examine the prospect of devising a new Canadian license that would permit Canadians to legally fish outside of Canada's EEZ or national jurisdiction.[60] In May 1995, the Government of Canada ruled that Canadian fishermen will not be allowed to fish outside Canadian waters unless specifically licensed by Canadian authorities to do so.[61] It is the belief of some officials that extraterritorial fishing is unlikely to be approved.

In 1996 is was reported that an unidentified Canadian company received a special, temporary three-month permit to fish for swordfish in Uruguayan waters. The permit allowed the company to determine whether fishing was profitable enough to warrant transferring the company's vessel, the *Tucan,* to Uruguayan registration. No further information is available on this operation.

B. Joint ventures

A number of Canadian fishermen expressed an interest in forming joint venture fisheries with Bermudians in 1994. Bermuda was interested in developing its offshore swordfish fisheries.[62] The Government of Canada halted the operation and the fishermen were fined for fishing without a Canadian license. The Canadian Government indicated it would examine the prospect of devising a new Canadian license that would permit Canadians to legally fish outside of Canada's EEZ or national jurisdiction.[63] In May 1995, the Government of Canada ruled that Canadian fishermen will not be allowed to fish outside Canadian waters unless specifically licensed by Canadian authorities to do so.

A group of Canadian fishermen are reportedly conducting an exploratory swordfish fishery off Uruguay which may lead to joint venture operations if the results prove profitable.

Future trends

Canadian fishermen are aware of the tremendous demand for swordfish that originates just south of their border with the United States. As long as U.S. importers are prepared to offer Canadian exporters top dollar for their swordfish -- often reaching markets in Boston within hours of being caught -- these fishermen will continue to fish for swordfish. The key to the future will be cooperation among members of ICCAT to agree to conservation and management measures and to effective means of enforcing these measures. These efforts will hopefully allow the Atlantic swordfish to recover and to be maintained at sustainable levels.

Before ICCAT was established, catch limits for Canadian fishermen were established by the Government of Canada. In 1994, however, ICCAT established a two-year agreement in which Canada agreed to catch 1,500 tons in 1995 and 1,400 tons in 1996. At the 1995 ICCAT meeting, a long-term sharing arrangement was worked out in which Canada accepted as its quota ten percent of the Total Allowable Catch (TAC) as determined by ICCAT. Thus, its percentage share will be the same each year until a new formula is established; the actual catch, by quantity, however, will likely fluctuate.

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1994 ATLANTIC SWORDFISH MANAGEMENT PLAN

MANAGEMENT MEASURES:

1. **QUOTAS:** A quota of 2,000 t is assigned for 1994 as follows:

    - Canadian longline and harpoon fishery
    - Bycatch for Canadian offshore tuna fishery*

2 **BYCATCH:**

    i) Longline vessels directing for swordfish are permitted to retain tuna, other than bluefin, caught incidentally.

    ii) A bycatch swordfish allowance may be provided for the offshore tuna fishery.*

3. **AREA:** A condition of license will appear on all swordfish licenses: "Valid for NAFO Convention Subareas 3, 4 and 5 only, excluding Fishing Zones 1 and 2 of Canada" (Gulf of St. Lawrence and Bay of Fundy).

4. **LIMITED ENTRY:** Swordfish longline licences and swordfish harpoon licenses will be available only to fishermen who held such licences in 1993.

5. **GEAR RESTRICTIONS:** Only swordfish longline and harpoon gear are permitted.

6. **SMALL FISH:** There will be a limit imposed on the taking and landing of swordfish less than 25kg (live weight). A length equivalent for this measure will be 125cm from the fork of the tail to the tip of the lower jaw. No more than 15% (by number of fish) of a vessel's catch per trip can be made up of such small swordfish.

7. **OPENING DATE:** The opening date for swordfishing will be June 1 for the 1994 fishing season.

* **Ministerial decision pending**.

8. DATA COLLECTION/MONITORING:

1) All licensed fishermen must submit log records to the Department of Fisheries and Oceans under the provisions of Section 61 of the Fisheries Act on the completion of each trip. This requirement also applies to vessels that fish, but do not catch any fish.

   If log records are not submitted during the fishery as required, fishermen will not be authorized to continue fishing. Submission of fully completed 1994 log records and tally sheets is required for 1995 license renewal.

2) The following information must be contained in the log records submitted by fishermen:

   (a) Name of vessel;
   (b) Type of fishing gear used;
   (c) Name of the captain and total number of crew;
   (d) Trip number;
   (e) Date of sailing from port and date of return;
   (f) Port or ports at which the catch is sold;
   (g) Name of buyer;
   (h) Day, month and year of fishing activity;
   (i) Position of fishing activity in latitude and longitude;
   (j) Depth at which fishing activity was carried out;
   (k) Quantity of fishing gear used in fishing effort;
   (l) Estimated weight of individual fish by species in pounds or kilograms;
   (m)Discards, dead or alive, by species

3) Scotia-Fundy based longline vessels are required to provide hails to a DFO-approved Operations Centre three hours in advance of landing after each trip. Further operational monitoring details will be specified in the conditions of license. Newfoundland based longline vessels will continue to be authorized to fish on a trip-by-trip basis.

1996 MANAGEMENT PLAN

ATLANTIC SWORDFISH FISHERY

DEPARTMENT OF FISHERIES AND OCEANS

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1996 ATLANTIC SWORDFISH MANAGEMENT PLAN

I. OVERVIEW OF THE ATLANTIC SWORDFISH FISHERY

1) History

The Atlantic swordfish fishery began commercially in the late 1880's as harpoon sailing vessels fished swordfish throughout Atlantic Canada and eventually expanded their fishery along the annual migration patterns of the eastern seaboard of North America. In the early 1960s, the Atlantic swordfish fishery shifted from a harpoon to a longline fishery and landings increased to a high of approximately 8,000t. Recorded landings decreased sharply in 1970 and gradually increased from the 1980s to the current level of activity.

2) Participants

There are 77 swordfish longline licences in Atlantic Canada, with 67 based in the Maritimes Region - Scotia-Fundy Fisheries, and ten in the Newfoundland Region. Sixty-nine of these vessels are less than 65' and eight vessels are between 65'-100'. Additionally, there are approximately 1,400 swordfish harpoon licences Atlantic-wide with 1,100 based in the Maritimes Region - Scotia-Fundy Fisheries, and 300 based in the Gulf Fisheries.

3) Location of Fishery

The Atlantic swordfish fishery usually begins in early June along eastern edges of the Canadian portion of Georges Bank and progresses throughout the summer months northeast along the edge of the Scotian Shelf. The fishery culminates in early fall along the outer areas of the Newfoundland Grand Banks. Swordfish are found where water temperatures form distinct thermoclines.

While specific fishing area locations may vary according to the thermoclines, longliners usually set their gear during daylight to enable the hooks to fish throughout the night. Vessels queue up for the best berths or positions to fish from 5-12 days at a time along the thin edge of thermoclines stretching approximately 900 kms along the outer edge of the Canadian fishing banks. Principle Canadian ports for swordfish landings include Shelburne, Sambro and Clark's Harbour in Nova Scotia and St. John's, Newfoundland.

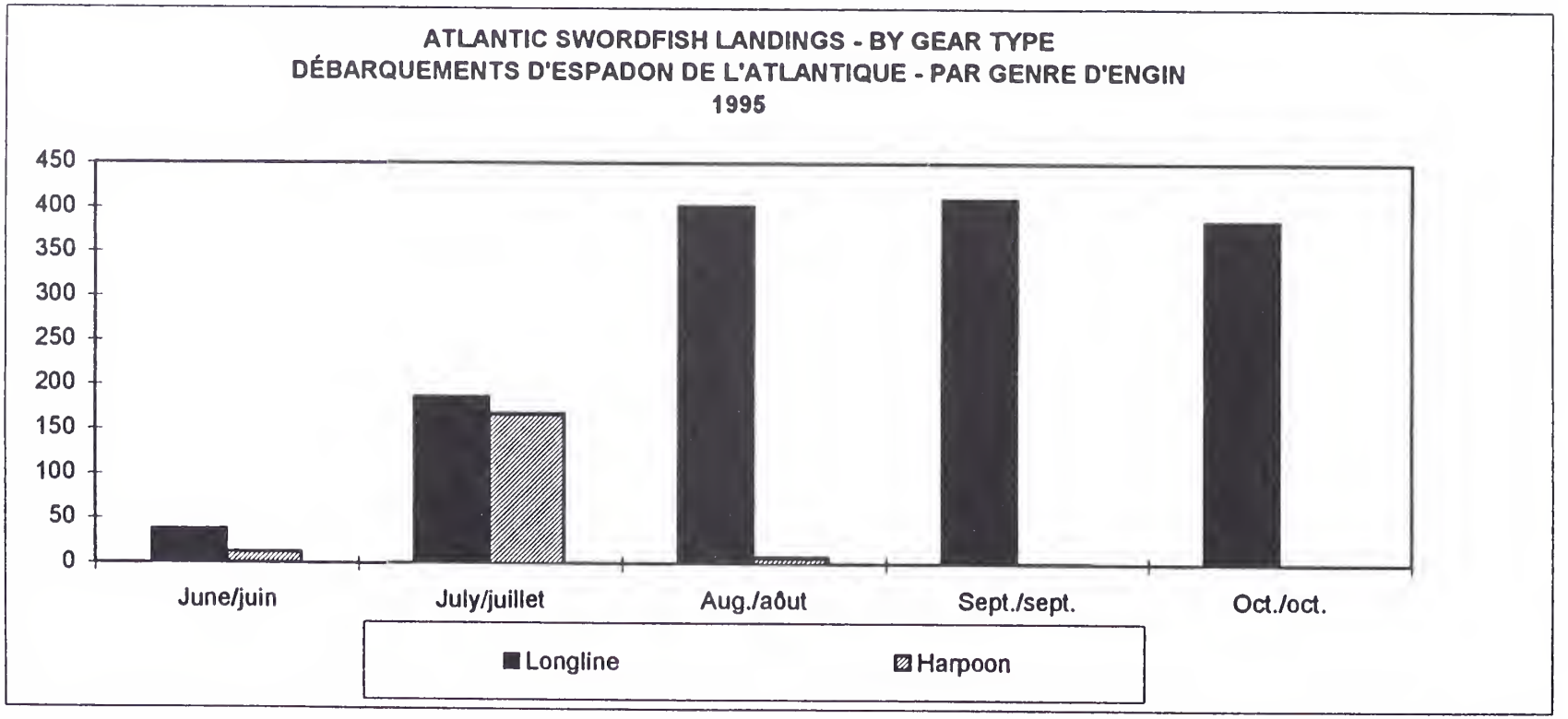
4) Timeframe of the Fishery

The 1995 season commenced June 1, 1995. Early season activity involved the larger longline vessels. Activity by smaller vessels and harpoon fishermen occurred from mid- to late-June through to October. In past years, landings by the longline fleet have continued as late as November, if quota has been available. In 1995, the fishery was closed on October 16. Monthly landings activity by gear type, for 1995, is represented on following page.

1995 SWORDFISH LANDINGS BY MONTH AND BY GEAR TYPE
DÉBARQUEMENTS D'ESPADON POUR 1995 PAR MOIS ET PAR GENRE D'ENGIN

(metric tonnes) / (tonnes métriques)

	June/juin	July/juillet	Aug./août	Sept./sept.	Oct./oct.
Longline	38.5	186.5	402.1	409.8	385.4
Harpoon	12.6	167.6	7.3	0.4	0.1



5) Landings/Value

Atlantic swordfish quotas and landings by gear type, for 1987-1995, are summarized on following page. The 1995 catch was worth $13.5 million. Ninety percent of swordfish landed in Canada is exported to the U.S. market.

6) Consultative Process

The Department of Fisheries and Oceans convenes bi-annual consultations with swordfish industry representatives in an advisory forum known as the Atlantic Large Pelagics Advisory Committee (ALPAC). An early spring meeting focuses on management recommendations for the up-coming fishing season. Consultations in the fall review the recent season's fishery and provide advice to Canada's delegation to the International Commission for the Conservation of Atlantic Tunas (ICCAT). The views expressed by swordfish representatives at ALPAC are determined by the Swordfish Working Group of the Regional Large Pelagics Advisory Committee, a group with participants from both the Newfoundland and Nova Scotia swordfish industries.

7) Management Style(s)

This fishery operates on a competitive basis with a 1,400t quota available in 1996 as per a 1994 ICCAT agreement. A reserve of 10% of the quota is being designated to allow swordfish licence holders to direct for tuna species other than bluefin later in the season. This reserve may be adjusted to better suit the "other" tunas directed fishery in consultation with industry. Additionally, during the directed "other" tunas fishery, a limitation on a trip-by-trip basis on the percentage by-catch of swordfish allowed will be determined in consultation with industry.

A 5t by-catch is provided to the offshore vessel licensed to fish tunas other than bluefin.

II. STOCK STATUS

1) Prospects for 1996

Swordfish fished in Atlantic Canada are part of the North Atlantic stock (Figure 1). Because of their migratory nature, swordfish are managed under the auspices of ICCAT.

The most recent assessment of north Atlantic swordfish (conducted in 1994) shows that the stock biomass has declined since the late 1970s and, in particular, the biomass of age 8+ fish (spawning stock) has shown a steady decline. North Atlantic catch and effort for swordfish increased continuously after 1978 when the United States mercury standards were revised. Despite reductions in catches in the order of 30% (to 15,000t in 1993) and fishing mortality since the peak levels in 1988, the population has continued to decline as catches have exceeded surplus production. The 1994 biomass was estimated to be 32% below the biomass at maximum sustainable yield. Projections

1987 - 1995

ATLANTIC SWORDFISH LANDINGS - BY GEAR TYPE/
DÉBARQUEMENTS D'ESPADON DE L'ATLANTIQUE - PAR GENRE D'ENGIN

GEAR/ ENGINS	1987	1988	1989	1990	1991	1992	1993	1994	1995 *
	TAC 3,500	TAC 3,500	TAC 3,500	TAC 3,500	TAC 2,000	TAC 2,000	TAC 2,000	TAC 2,000	TAC 1,500
	Weight/ Poids	Weight/ Poids	Weight/ Poids	Weight/ Poids	Weight/ Poids	Weight/ Poids	Weight/ Poids	Weight/ Poids	Weight/ Poids
Longline/ Palangres	868	910	1,090	818.1	956.4	1486	2206	1,654	1,422
Harpoon/ Harpon	77	58	144	91.4	72.2	60	28	22	188
Grand Total *	**945**	**968**	**1,234**	**909.5**	**1028.6**	**1546**	**2234**	**1,676**	**1,610**

* Preliminary/Préliminaire

** Includes landings by other gear (gillnet, troller, trawls)./Inclus les prises par autres genres d'engins (filets maillants, lignes trainantes et chaluts à panneaux.

*** Catches of Canadian vessels in Bermuna operation / Prises des bateaux canadiens aux Bermudes.

Landings shown in metric tonnes/Débarquements montrés en tonnes métriques

Prepared by: Resource Management - Atlantic

Rapport préparé par la Gestion des ressources - Atlantique

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conducted in 1995 using 1994 catches and the anticipated 1995 and 1996 catch levels show the continued decline of the north Atlantic swordfish stock, even under the new 1995/96 quota scenarios set in 1994.

The Standing Committee on Research and Statistics (SCRS) of ICCAT concluded on the basis of the 1994 assessment and the projections conducted in 1995 that, in order to rebuild the north Atlantic swordfish stock, both fishing mortality rates and catch must be reduced considerably in the immediate future. The quotas set by the ICCAT Commission for 1996 still exceed surplus production: 1996 surplus production estimate is 10,000t and anticipated catches in 1996 are 13,900t. It is expected that the population will decline further.

In recognition of the severe state of depletion of swordfish stocks, Canada has imposed stringent catch and effort controls throughout its swordfish fishery. Canada introduced limited entry into the swordfish fishery in 1979, and has since limited the number of vessels at 77 all under 100 feet and froze the number of harpoon licences at approximately 1,400. Other effort controls include limiting the fishery to start on June 1, restricting the fishery to outside the Canadian Fishing Zones 1 and 2 (Gulf of St. Lawrence and the Bay of Fundy), and closing a portion of the Scotian Shelf to protect the large swordfish or broodstock. In addition, the fleet is restricted to a minimum fish size of 119 cm, and all vessels must compile detailed log records and tally sheets and have all landings adhere to an industry funded independent third party Dockside Monitoring (DMP). In this program vessels must hail to the DMP company both before leaving and entering port and have dockside observers identify and weigh each fish for subsequent direct data entry into DFO's statistical system. These requirements ensure the accurate monitoring of directed and by-catch quotas, vessels are periodically required to carry observers at the discretion of DFO, and offshore fishery officers will conduct random boardings of swordfish vessels throughout the season.

2) Environment and Habitat

A number of changes in the swordfish population and their environment have been observed in recent years, but our current knowledge of the interaction between biology and environment does not permit prediction of future changes.

Swordfish are distributed widely in the tropical and temperate waters of the Atlantic Ocean and Mediterranean Sea. They spawn in tropical and sub-tropical waters throughout the year. As swordfish migrate northward in late winter and early spring they begin to enter Canadian waters in May along Georges Bank and range northeast along the edge of the Scotian Shelf and the Grand Banks of Newfoundland.

Over the years, the size structure of the catch of swordfish has changed. This is due in part to a reduction in the population size of the larger fish, and to an expansion of the fishing range of nearshore and high seas fleets into warmer waters where small fish are found. In Canada, the fishing locations have changed little. Swordfish are found on edges where water goes from deep to shallow and where water temperature forms a distinct thermocline.

Adult swordfish have few natural predators, with the possible exception of predacious sharks. They feed on a wide variety of prey including groundfish, small pelagics, deep-water fish and invertebrates. They are found throughout the water column but are typically caught on longline at night during their night-time migration to feed in surface waters. As top predators, they are subject to an accumulation of marine pollutants, notably mercury. The broad diet and habitat preference of swordfish make them very adaptable to changes in habitat. Little is currently known about the aggregation of relatively large swordfish along the edge of the Scotian Shelf land ward of the 100 fathom contour line.

3) Species Interactions

Swordfish are caught primarily in directed longline and harpoon swordfish fisheries and are not caught as a by-catch of other fisheries. However, other large pelagic species such as bigeye, yellowfin, albacore, dolphin fish, various species of sharks and bluefin tuna are inevitably caught as a by-catch of the swordfish longline fishery. New log records adopted in 1995 better quantified this by-catch. During the 1995 fishery, the opening of the swordfish longline fishery west of a line drawn from the southern portion of Nova Scotia at 65°30', 200-mile limit was delayed until 1 August to minimize the by-catch of bluefin tuna.

As noted above, there are few natural predators of large swordfish, so predation has little influence on swordfish abundance.

4) Research

The DFO Science/Nova Scotia Swordfishermen's Association Cooperative Juvenile Swordfish Tagging Program will be continued in 1996. The second focus of research is to improve the quality of the input information (both catch and effort) for the assessment, and to update the biomass and age-specific indices of relative abundance for the Canadian fishery using commercial catch rate data. The next full ICCAT assessment of stock status is scheduled for October 2-9 1996 in Halifax, N.S.

III. MANAGEMENT OBJECTIVES/ISSUES

1) To ensure that the 1996 swordfish fishery adheres to Canadian, ICCAT and the UN **Agreement on Highly Migratory Species** conservation objectives and principles. by limiting the fishery to a quota of 1,400t.

2) To minimize the catch of small fish less than 119 cm and promote the release of small fish back to the water in a manner that enhances the survival.

3) To minimize the by-catch of bluefin tuna and shark species.

4) To provide for a by-catch in directed fisheries for bigeye, yellowfin and albacore tuna.

5) To provide data collection for the purpose of quota monitoring and scientific research.

IV. MANAGEMENT MEASURES FOR 1996

1) Quota Allocations

a) In adherence to conservation commitments to ICCAT, the Canadian quota for the 1996 calendar year is established at 1,400t.

b) The by-catch provision afforded to the "offshore vessel" licensed to fish tunas other than bluefin will be 5t for 1996.

c) In order to permit a swordfish by-catch of a directed fishery for tuna (bigeye, yellowfin, and albacore) other than bluefin, 10% of the Canadian quota of 1,400t (140t) will be held in reserve. This reserve may be adjusted in consultation with industry. A limitation, on a trip-by-trip basis, on the percentage by-catch of swordfish in a directed fishery for tunas other than bluefin, will be determined in consultation with industry.

d) When 75% of the directed 1,260t swordfish fishery is caught (950t), the Department may close the fishery on a temporary basis and require immediate hails from all vessels at sea to verify total catch. The Department will convene discussions with the licence holders to review the most optimum course of action at that time.

e) 1996 Canadian Swordfish Allocation (tonnes):

-	directed fishery	1,255t
-	swordfish fleet by-catch (tunas)	140t
-	offshore vessel by-catch (tunas)	5t

f) 1996 North Atlantic ICCAT Swordfish Allocations by Country (tonnes):

-	Spain	5,500t
-	United States	3,500t
-	Portugal	1,400t
-	Canada	1,400t

2) Fishing Seasons/Areas

a) All harpoon and longline swordfish licences will be valid for NAFO Convention sub-areas outside the fishing areas of adjacent countries and outside the Canadian Fishing Zones 1 and 2 (Gulf of St. Lawrence and Bay of Fundy).

b) To maximize the avoidance of bluefin by-catches, the Canadian season for swordfish longline and harpoon vessels will open on June 1, 1996, east longitude 65°30' (Figure 2).

c) The area west of 65°30' longitude to the Canada/U.S. Hague Line will open to swordfish longline gear on August 1, 1996 (Figure 2).

d) A pelagic longline closure encompassing an area known as the "Hell Hole" will be put in place should by-catches of bluefin tuna become a conservation problem. This area is delineated by straight lines joining the following points in the order listed below: (Figure 2).

1.	42°06.0'N	65°41.4'W
2.	42°06.0'N	65°27.5'W
3.	41°55.8'N	65°27.5'W
4.	41°55.8'N	65°41.4'W
5.	42°06.0N	65°41.4'W

e) Should an area be closed for directed swordfish fishing because of conservation reasons (i.e., inordinately high by-catches of bluefin, or higher than usual levels of small fish), the Department will confer with swordfish associations and industry interests to immediately implement the provisions of **a Contingency Protocol for the 1996 Atlantic Swordfish Fishery** to close, survey and possibly reopen the fishery (Appendix 1).

f) In an effort to enhance conservation of large and broodstock swordfish, an area between the coastline and a buffer zone 15 nautical miles land ward of the 100 fathom edge of the Scotian Shelf continental slope will be closed to all pelagic swordfish longline fishing from September 1 to December 31, 1996 (see licence conditions).

3) Control and Monitoring of Fishing Activities

a) All harpoon and longline swordfish landings must, as a condition of licence, adhere to the requirements of an independent industry-funded Dockside Monitoring Program (see attachments 1 and 2).

b) All swordfish harpoon and longline vessels shall, as a condition of licence, be required to provide detailed log (attachment 3) and tally records of catches (attachment 4) and be required intermittently throughout the fishery to carry observers at the request of the Department.

c) Finning (the practice of removing only the fins from sharks and discarding the remainder of the shark at sea) is strictly prohibited.

Fins may be sold, traded or bartered, but only in proper proportion to carcasses sold, traded or bartered with a maximum of 5% fins per dressed carcass weight. Fins may not be stored aboard the vessel after associated carcasses are sold, traded or bartered and must be weighed and monitored at the time of DMP.

4) Other Relevant Elements to the 1996 Management Plan

Licensing

The limited entry provisions for the issuance of swordfish longline and harpoon licenses will be maintained. As of February 1993, swordfish longline licences may be re-issued between fishermen in different provinces or DFO management regions.

Both swordfish harpoon and longline vessels will be required to adhere to the provisions of specific Conditions of Licence.

The freeze, imposed in 1995 on the re-issuance of harpoon licences, is rescinded and, effective June 1, 1996, harpoon licences will be re-issuable within each of the three designated management areas of the Scotia-Fundy Fisheries. (All re-issuances are subject to the current **Commercial Fisheries Licensing Policy for Eastern Canada**).

Minimum Fish Size

In an effort to enhance the conservation of small fish this plan has incorporated the following recommendations from ICCAT.

Regarding the implementation of an alternative option for the conservation of undersized Atlantic swordfish and the reduction of fishing mortality, in order to protect small swordfish, any Contracting Party may choose, as an alternative to the existing 1991 recommendation regarding the minimum size of swordfish, to take the necessary measures to prohibit the taking by its vessels of swordfish in the Atlantic Ocean, as well as the landing and sale in its jurisdiction, of swordfish and swordfish parts, less than 119 cm from the tip of the lower jaw to the fork of the tail, or the equivalent in weight, provided that no tolerance of swordfish smaller than this alternative minimum size shall be allowed. A party which chooses this alternative shall require appropriate record keeping of discards.

* *In 1991, the Commission adopted a prohibition on the taking and landing of swordfish in the entire Atlantic Ocean, weighing less than 25 kg live weight (125 cm lower jaw fork length), but allowing Contracting Parties to have a 15% tolerance of small fish in number of fish to boats that incidentally catch such fish.*

Other

Swordfish longline licence holders are encouraged to continue to participate in swordfish tagging programs.

FIGURE 1

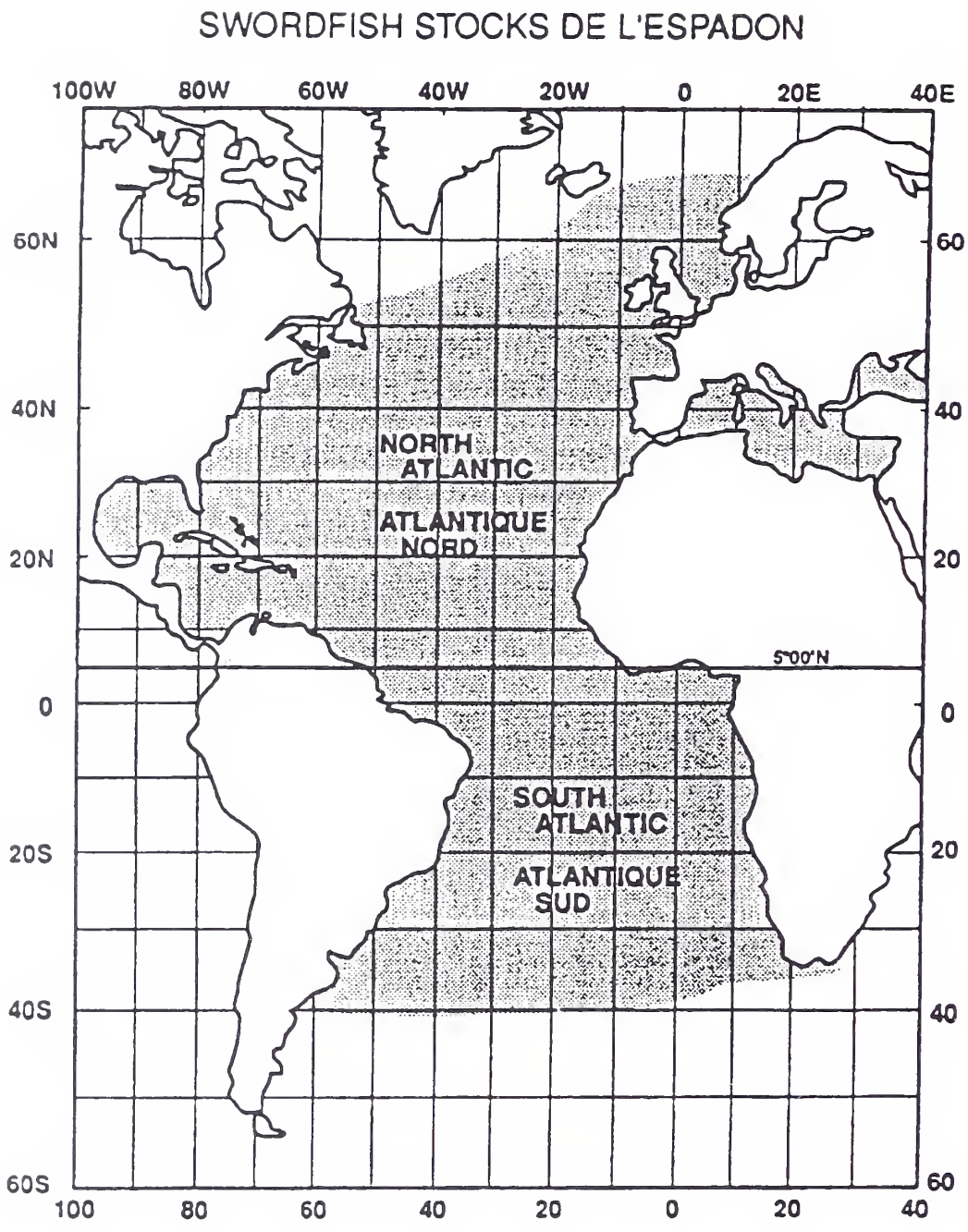
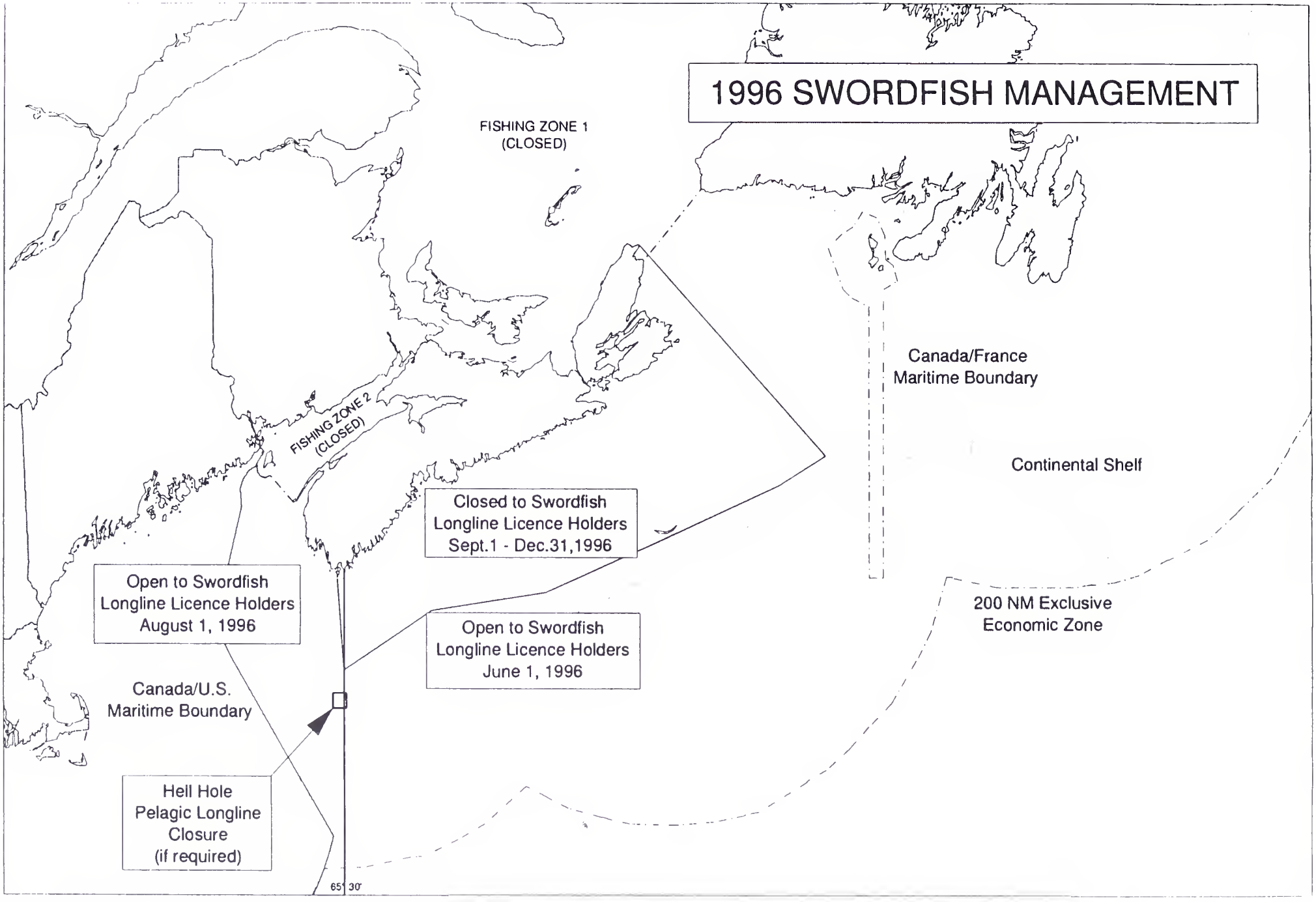

SWORDFISH STOCKS DE L'ESPADON
100W
80W
60W
40W
20W
0
20E
40E
60N
40N
20N
0
20S
40S
60S
NORTH ATLANTIC
ATLANTIQUE NORD
5°00'N
SOUTH ATLANTIC
ATLANTIQUE SUD

FIGURE 2


1996 SWORDFISH MANAGEMENT
FISHING ZONE 1
(CLOSED)
FISHING ZONE 2
(CLOSED)
Canada/France
Maritime Boundary
Continental Shelf
Closed to Swordfish
Longline Licence Holders
Sept.1 - Dec.31,1996
Open to Swordfish
Longline Licence Holders
August 1, 1996
Open to Swordfish
Longline Licence Holders
June 1, 1996
200 NM Exclusive
Economic Zone
Canada/U.S.
Maritime Boundary
Hell Hole
Pelagic Longline
Closure
(if required)
65° 30'

APPENDIX I

CONTINGENCY PROTOCOL FOR THE

1996 ATLANTIC SWORDFISH FISHERY

OBJECTIVE:

Should the directed swordfish fishery be considered closed for conservation reasons, the Department will initiate dialogue with swordfish associations, and direct industry interests to immediately implement the following contingency protocol.

A. CLOSURE CRITERIA:

A Swordfish closure involving a time frame, and or area may be invoked when one or more of the following trigger mechanisms occur:

1. The *Atlantic Fishery Regulations* stipulate a zero (0) tolerance of bluefin tuna by-catch. Closure action will occur should this be exceeded based on observations from either at sea inspections by the Department of Fisheries and Oceans (DFO) Fishery Officers, or by at sea observers.

2. The swordfish license conditions stipulate that no person may retain during a fishing trip, a number of swordfish less than 73 cm in length with o tolerance for undersized fish.

   If inordinate discards and associated mortalities are evident, the Department will invoke immediate contingencies.

B. ACTION OPTIONS

The Department will initiate consultation with swordfish associations, and direct industry interests to consider which of the following actions should be implemented:

1. Continue the fishery at a reduced level of activity with a high level of observer coverage on a shared cost basis between DFO - industry.

2. Close a fishery area for a specific time period and implement a comprehensive test fishery in accordance with pre-determined criteria.

3. Close a fishery area for a specific time period and conduct no test fishery.

C. TEST FISHERY ELEMENTS:

Should a test fishery option be considered, the Department will review detailed proposals from swordfish associations, and direct industry interests on how to apply the following test fishery elements:

1. The criteria for opening the fishery are the reverse of the closure criteria.

2. The swordfish associations will determine which vessels may participate in the test fishery.

3. Vessel operators are responsible for all observer costs during the duration of the test fishery.

4. Each vessel participating in the test fishery will be permitted to complete their normal fishing trip.

5. The Department will monitor and analyze the results of the test fishery in conjunction with swordfish associations.

ATTACHMENT 1

SWORDFISH LONGLINE LICENCE CONDITION
MARITIMES REGION
1996

Pursuant to sub-section 22 (1) of the *Fishery (General) Regulations* as amended, the following conditions are specified for person(s) fishing under the authority of Swordfish Licence No. _____ issued in respect of the fishing vessel _____ CFV No. _____.

1. These licence conditions are valid in:

   Sub-areas 3 and 4 east of longitude 65°30', excluding Fishing Zones 1 and 2 of Canada during the period beginning June 1, 1996, and ending July 31, 1996.

   and

   Sub-areas 3, 4 and 5, excluding Fishing Zones 1 and 2 of Canada during the period beginning August 1, 1996, and ending December 31, 1996.

2. You are not permitted to fish between September 1 and December 31, 1996 in the waters enclosed by the coastline of Nova Scotia and straight lines joining the following points in the order in which they are listed:

Point	Latitude (N)	Longitude (W)	
1.	43°23'18"	65°37'10"	(Cape Sable N.S.)
2.	42°22'	65°30'	
3.	43°02'	64°00'	
4.	43°14'	62°00'	
5.	43°49'	60°00'	
6.	44°25'	58°00'	
7.	44°45'	57°10'	
8.	47°01'46"	60°23'25"	(Money Point N.S.)

3. You are permitted to retain bigeye, yellowfin and albacore tuna provided all tuna landed have at least one pectoral fin attached to the fish.

4. The catch and retention of swordfish having a lower jaw to fork length of less than 119 cm is prohibited. For the purpose of compliance with this licence condition, you will be permitted to retain dressed swordfish of 73 cm or greater as measured from the leading edge of the cleithrum to the anterior origin of the caudal keel following the curve of the body (as per attached chart).

5. While fishing under these licence conditions you are only permitted to use the gear type listed below that has been validated by a fishery officer:

(a) longline; yes/no F/O

(b) harpoon; yes/no F/O

REPORTING REQUIREMENTS

6. You are required to hail to a DFO approved Catch Reporting/Dockside Monitoring Company prior to leaving port. The hail must include the vessel name; the CFV number; the Captain's name; your swordfish licence number; the date, time (using the 24 hour system) and area where you intend to commence fishing.

7. You are further required to hail to a DFO approved Catch Reporting/Dockside Monitoring Company at least 3 hours prior to returning to port, whether you have fish or not. The hail must include the vessel name; the CFV number; the Captain's name; your swordfish licence number; the round weight of fish on board your vessel by count and estimated weight; the NAFO stock area where the fish were taken; the date, time (using the 24 hour system) and place where you intend to land your fish.

You will be issued a confirmation number by the Catch Reporting Company confirming that your hail has been received. This number is to be entered on the Swordfish/Shark Longline Monitoring Document.

8. The master of the vessel is required to provide access to the vessel and fishing log records to the assigned dockside observer for the purpose of monitoring the landing of all fish and recording the weight of all catches. All catch landed must be weighed on a scale certified by Consumer and Corporate Affairs Canada at the dockside point of landing.

9. You are required to separate your fish by species and supply the Department of Fisheries and Oceans with an accurate weight within 24 hours after landing the fish from your vessel or prior to receiving authorization to sail on your next trip, whichever comes first.

10. You are required to have the weight and species of fish landed from your vessel verified by an observer (dockside). For the purpose of this licence condition an observer (dockside) is a person designated as an observer by the Regional Director General for Maritimes Region (Scotia-Fundy) and who has been appointed to monitor the landing of fish and to verify the weight and species of fish caught and retained.

11. You are not permitted to land (unload) any fish from your vessel unless an observer is present to verify the weight and species of the fish that is landed.

12. Subject to Section 61 of the *Fisheries Act* you are required to provide information regarding your fishing activities in the **Swordfish/Shark Longline Monitoring Document, Purchase Slip, and Tally Sheet** document available from the Department of Fisheries and Oceans. You are also required to complete the document in accordance with the supplied instructions. You are further required to supply the Department of Fisheries and Oceans at the end of each fishing trip with a copy of all document entries. This shall be done by supplying the observer (dockside) with a copy of the documents.

13. You are authorized to retain an incidental catch of shark. However, the practice of removing only the fins from sharks and returning the remaining portion of the carcass to the water is prohibited.

14. You may remove fins from any shark you have retained. However, the weight of any fins so removed cannot exceed 5% of the weight of the corresponding dressed shark carcasses you have retained.

15. If you are also the holder of a bluefin tuna licence, the period of validity of which is concurrent with these licence conditions, you are not permitted to fish pursuant to both licences during the same fishing trip.

16. Fishers are reminded that pursuant to sub-section 103 (1) of the *Atlantic Fishery Regulations, 1985*, you are not permitted to retain bluefin tuna. Recent amendments to the *Atlantic Fishery Regulations, 1985* placed size limits on yellowfin and bigeye tuna.

17. I requested and received this licence in English. I understand and acknowledge the conditions contained in this licence.

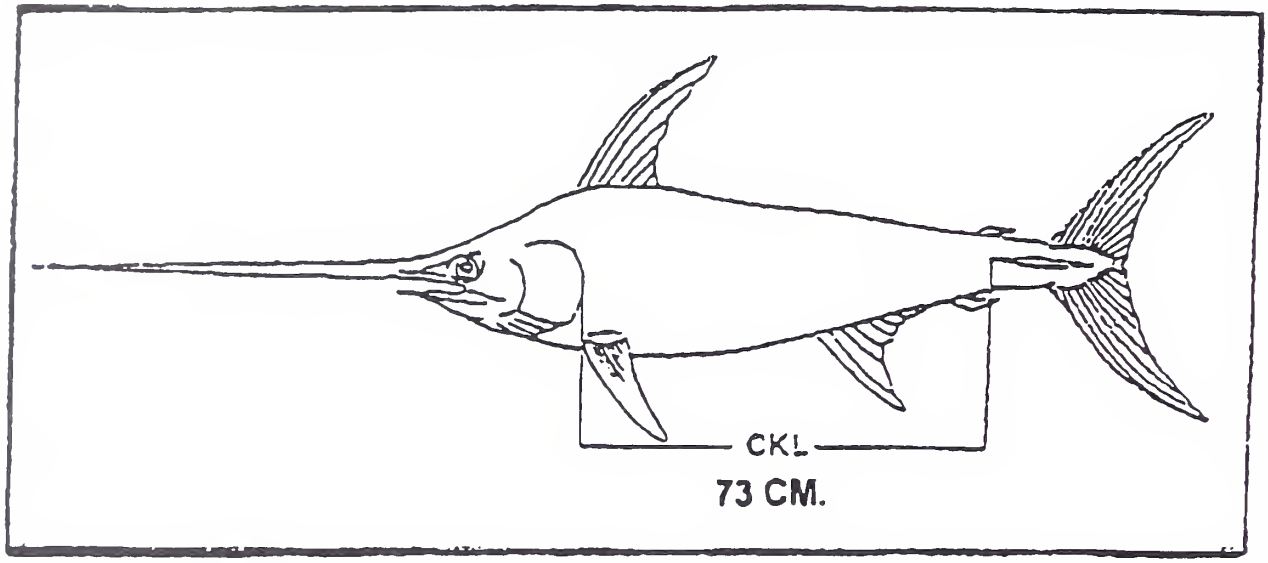
18. Fishermen are reminded that it is an offense under the *Atlantic Fishery Regulations, 1985* to transport fish caught by another vessel or to put fish on board another vessel without a fish transporting licence.

_____ _____

Signature of Licence Holder Date

_____ _____

Signature of Licensing Officer Date



CANADIAN
SWORDFISH MEASUREMENT
1996

CLEITHRUM TO KEEL LENGTH (CKL) OR DRESSED LENGTH

The distance in centimetres from the leading edge of the cleithrum to the anterior origin of the caudal keel, following the curve of the body (using a tape measure). The position for measurement from the cleithrum must be at the point of minimum distance to the origin of the caudal keel. Swordfish which are less than 73 cm. CKL are below the current minimum harvestable size.

NOTE TO SWORDFISH LONGLINE LICENCE HOLDERS

Should a test fishery conducted under the auspices of the Contingency Protocol for the 1996 Atlantic Swordfish Fishery indicate there is not a bluefin conservation issue, the area west of 65°30' may be opened to swordfish longline vessels prior to July 31, 1996.

ATTACHMENT 2

SWORDFISH HARPOON LICENCE CONDITIONS
MARITIMES REGION
1996

Pursuant to sub-section 22 (1) of the *Fishery (General) Regulations* as amended, the following conditions are specified for person(s) fishing under the authority of Swordfish Licence No. _____ issued in respect of the fishing vessel _____ CFV No. _____.

1. You are only authorized to use swordfish harpoons to catch swordfish.

2. These licence conditions are valid in sub-areas 3, 4, and 5 only, excluding Fishing Zones 1 and 2 of Canada during the period beginning June 1, 1996, and ending December 31, 1996.

3. You are required to hail to a DFO approved Catch Reporting/Dockside Monitoring Company at least 3 hours prior to returning to port when you have swordfish on board. The hail must include the vessel name; the CFV number; the Captain's name; your swordfish licence number; the round weight of swordfish on board your vessel by count and estimated weight; the NAFO stock area where the fish were taken; the date, time (using the 24 hour system) and place where you intend to land your fish.

   You will be issued a confirmation number by the Catch Reporting Company confirming that your hail has been received. This number is to be entered on the Swordfish Harpoon Monitoring Document.

4. You are required to provide the Department of Fisheries and Oceans with an accurate weight after landing the fish from your vessel, either within 24 hours or prior to receiving authorization to sail on your next trip, whichever comes first.

5. The master of the vessel is required to provide access to the vessel and fishing log records to the assigned dockside observer for the purpose of monitoring the landing of all fish and recording the weight of all catches. All catch landed must be weighed on a scale certified by Consumer and Corporate Affairs Canada at the dockside point of landing. You are required to separate your fish by species.

6. You are required to have the weight of your swordfish landed from your vessel verified by an observer (dockside). For the purpose of this licence condition, an observer (dockside) is a person designated as an observer by the Regional Director General for Maritimes Region and who has been appointed to monitor the landing of fish and to verify the weight and species of fish caught and retained.

7. You are not permitted to land (unload) any swordfish from your vessel unless an observer is present to verify the weight of the swordfish that is landed.

8. Pursuant to Section 61 of the *Fisheries Act* you are required to provide a properly completed Swordfish Harpoon Monitoring document for those trips in which you have not caught any swordfish. This document must be forwarded to the Department of Fisheries and Oceans within 7 days of the completion of a trip.

9. The catch and retention of swordfish having a lower jaw to fork length of less than 119 cm is prohibited. For the purpose of compliance with this licence condition, you will be permitted to retain dressed swordfish of 73 cm or greater as measured from the leading edge of the cleithrum to the anterior origin of the caudal keel following the curve of the body (as per attached chart).

10. I requested and received this licence in English. I understand and acknowledge the conditions contained in this licence.

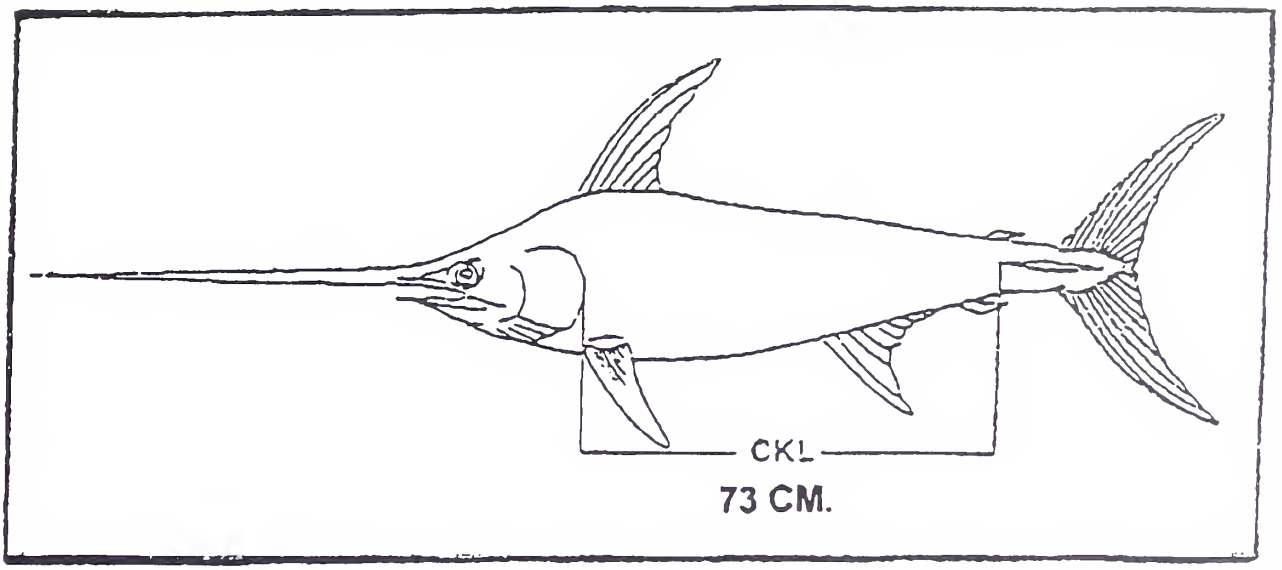
11. Fishermen are reminded that it is an offense under the *Atlantic Fishery Regulations, 1985* to transport fish caught by another vessel or to put fish on board another vessel without a fish transporting licence.

_____ _____

Signature of Licence Holder Date

_____ _____

Signature of Licensing Officer Date



CANADIAN
SWORDFISH MEASUREMENT
1996

CLEITHRUM TO KEEL LENGTH (CKL) OR DRESSED LENGTH

The distance in centimetres from the leading edge of the cleithrum to the anterior origin of the caudal keel, following the curve of the body (using a tape measure). The position for measurement from the cleithrum must be at the point of minimum distance to the origin of the caudal keel. Swordfish which are less than 73 cm. CKL are below the current minimum harvestable size.

ATTACHMENT 3

ATLANTIC SWORDFISH/SHARK LONGLINE MONITORING DOCUMENT INSTRUCTIONS

ONE LOG SHOULD BE SUBMITTED FOR EACH FISHING TRIP WHETHER OR NOT FISH ARE LANDED. LOGS MUST BE SUBMITTED BEFORE THE **AUTHORIZATION NUMBER TO FISH** FOR ANOTHER TRIP IS ISSUED.

A. GENERAL INFORMATION

PLEASE ENSURE THAT ALL THE INFORMATION ON THE TOP-LEFT-HAND PORTION OF THE LOG DOCUMENT IS FILLED IN. THE **AUTHORIZATION NUMBER TO FISH** MUST BE OBTAINED FROM A DFO APPROVED OPERATIONS CENTRE BEFORE YOU ARE ALLOWED TO GO LONGLINE FISHING FOR SWORDFISH OR SHARKS. A NEW AUTHORIZATION NUMBER IS REQUIRED FOR EACH FISHING TRIP.

B. LONGLINE GEAR

FILL IN SPECIFICS ON THE GEAR INCLUDING: **GANGING LENGTH** IN FATHOMS, **HOOK SIZE, HOOK TYPE** (E.G., CIRCLE OR 'J') AND **DISTANCE BETWEEN HOOKS** IN FATHOMS.

C. HAIL AND LANDING INFORMATION

FILL IN **DATE SAILED AND LANDED, PORT SAILED AND LANDED,** THE **TIME LANDED** (IN THE 24-HOUR CLOCK), AND THE **WHARF LANDED.** ALL OF THIS INFORMATION IN ADDITION TO **ESTIMATED WEIGHTS** OF FISH CAUGHT BY SPECIES, MUST BE HAILED TO THE OPERATIONS CENTRE BEFORE LANDING IN ORDER TO OBTAIN THE **CONFIRMATION NUMBER.** THIS CONFIRMATION NUMBER MUST BE RECORDED IN THIS SECTION OF THE LOG DOCUMENT.

D. LOG INFORMATION

ON THE LOG PORTION OF THE DOCUMENT, EACH LINE SHOULD CONTAIN INDIVIDUAL SET INFORMATION. THERE IS SPACE ENOUGH FOR 14 SETS, WHICH SHOULD COVER AN ENTIRE TRIP. IF THE TRIP IS LONGER THAN THIS, ANOTHER SHEET SHOULD BE USED TO COMPLETE THE TRIP. IT IS ESSENTIAL THAT ALL OF THE LOG INFORMATION IS FILLED OUT CLEARLY AND COMPLETELY. FOR THE **TYPE OF BAIT,** INDICATE THE SPECIES (MACKEREL, HERRING, SQUID, ETC.). THE **SWORDFISH ESTIMATED CATCHES** ARE RECORDED IN 3 CATEGORIES: SWORDFISH **KEPT** (NUMBER AND ESTIMATED WEIGHT IN POUNDS ROUND), THE NUMBER OF SWORDFISH **DISCARDED ALIVE,** AND THE NUMBER OF SWORDFISH **DISCARDED DEAD.** THE **TUNA AND SHARK ESTIMATED CATCHES** INCLUDE ALL FISH CAUGHT (KEPT PLUS DISCARDED), AND MUST INCLUDE THE **NUMBER OF FISH** AND **TOTAL WEIGHT** OF FISH (POUNDS ROUND) BY SPECIES FOR EACH SET. PLEASE INDICATE THE PARTICULAR SPECIES OF TUNA OR SHARK CAUGHT USING THE CODES AS FOLLOWS: BLUEFIN = BFT; YELLOWFIN = YFT; BIGEYE = BET; ALBACORE = ALB; BLUE SHARK = BLS; SHORTFIN MAKO = SMS; PORBEAGLE = PBS. OTHER SPECIES NOT LISTED (E.G., OTHER SPECIES OF SHARK, MARLIN, ETC.) CAN BE WRITTEN IN AND THE CATCH FOR EACH SET RECORDED. PLEASE NOTE THE **WEATHER CONDITIONS** (WIND SPEED AND DIRECTION, RAIN, ETC.) FOR EACH SET.

E. WEIGHOUT SLIP AND SIGNATURES

FILL IN THE **NAME OF THE COMPANY BUYING** THE FISH AND THE MAIN **NAFO AREA** FISHED. AT THE BOTTOM OF THE WEIGHOUT SLIP, THE **CAPTAIN'S NAME** MUST BE FILLED IN WITH A **SIGNATURE** FROM HIM/HER TO INDICATE THE LOG INFORMATION IS CORRECT. THE BUYER WILL FILL OUT THE REMAINDER OF THE WEIGHOUT SLIP. THE BUYER MUST FILL IN THE WEIGHED OUT **AMOUNTS OF FISH FOR EACH SPECIES** INDICATING THE **CONDITION** OF THE FISH (E.G., DRESSED HEAD OFF, TAIL OFF; DRESSED HEAD OFF, TAIL ON; DRESSED HEAD ON, TAIL OFF; DRESSED HEAD ON, TAIL ON; ROUND), **THE NUMBER OF FISH** AND THE **TOTAL WEIGHT** IN POUNDS. THE BUYER MUST ALSO INDICATE A **PRICE PER POUND** FOR EACH SPECIES. WHEN THE BUYER HAS COMPLETED THE WEIGHOUT SLIP, AN AGENT FOR THE **BUYER MUST FILL IN HIS/HER NAME AND SIGN** IN THE SPACE PROVIDED.

A COMPLETED *SWORDFISH, TUNA AND SHARK RECEIVING TALLY* MUST BE SUBMITTED WITH THIS *SWORDFISH/SHARK LONGLINE MONITORING DOCUMENT* BEFORE AUTHORIZATION FOR ANOTHER TRIP IS ISSUED.

ATTACHMENT 4

Office Use Only

SWORDFISH, TUNA AND SHARK RECEIVING TALLY*

Gear Type:_____ Document #:_____

NAFO Unit Area:_____ Captain's Name:_____

Date Landed:_____ Address:_____

Vessel Name:_____ Buyer Name:_____

Trip #:_____ Port Landed:_____

Vessel CFV:_____

Individual weights of fish (lb dressed - gutted, head off, tail off)

	Swordfish 100+ lbs		Swordfish 50-99 lbs		Swordfish 25-49 lbs		Swordfish <25
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14				Tunas - indicate species		Sharks - indicate species	
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
Total							

If additional space is required, please relabel columns or use another sheet.

ANNEX I

MANAGEMENT PLAN EVALUATION CRITERIA

1. Catch targets met but not exceeded.

2. Catch of small fish reduced/minimized.

3. Reduction/elimination of bluefin tuna by-catch.

4. Designated by-catch of swordfish has provided for a tuna fishery directing for bigeye, yellowfin and albacore.

5. Collection of data for quota monitoring and scientific research.

ANNEX II

CONSERVATION AND PROTECTION PLAN EVALUATION CRITERIA

1. Number of incident reports.
2. Number of boarding (at-sea/dockside).
3. Number of dockside checks.
4. Number of vessel sightings.
5. Number of violations.
6. Number of violations as a result of vessel patrols.
7. Number of violations as a result of air patrols.
8. Results of client surveys.
9. Feedback from fishery officers.
10. Feedback from advisory groups.

ANNEX III

LARGE PELAGICS ADVISORY COMMITTEE

SWORDFISH WORKING GROUP MEMBERSHIP

Name	Organizations	Address
Chairman		
P. Partington	Fisheries & Oceans	Halifax
Fishers		
W. Henneberry		Sambro
G. Martin		Sambro
C. Henneberry		Sambro
F. Reyno		Sambro
T. Malone		Lwr. East Pubnico
K. Malone		Lwr. East Pubnico
D. Atkinson		West Head C.S.I.
R. Swim		Clark's Hbr
G. Pothier		Wedgeport
R. LeBlanc		Wedgeport
A. Wickens Jr.		Bear Point
T. Goreham		Woods Hbr.
R. Arsenault		Lwr. East
R. Hatfield		Upper Port
K. Jollimore		Terence Bay
E. Jollimore		Terence Bay
L. Smith		Cape Island
S. Williams		Shelburne
K. Stoddard		Shelburne
G. Reyno		Sambro
S. Keating		Eastern Shore
M. Wickens		Shag Harbour
J. Nickerson		Port LaTour
K. Taylor		Shelburne
S. Larkin		Woods Hbr.
L. Dixon		Woods Hbr.
W. Jewers		Sambro
F. Hennessey		Souris
R. Fraser		Pleasant Bay
E. Whiteway		Lockeport
H. Newell Jr.		Queens Co.

Associations

N. Smith	N.S. Longliners	Shelburne
E. Smith	Seafood Prod. Assoc.	Shag Harbour
N. Smith	S.W.N.S.L.L.A.	Cape Island
J. Andrews	S.P.A.N.S.	Dartmouth
G. Dalton	Ind. Seafood Prod.	Yarmouth
D. Aldous	SW Nova Tuna Assoc.	Hants Co.

Processors

P. Swim	Island Marine Prod.	Clark's Hbr.
J. Mood	Processor/Buyers	Woods Hbr.
D. Hart	B + J Fisheries	Sambro
S. Elsworth	Processor/Buyer	Sambro
C. Malone	Processor/Buyer	Woods Hbr.
J. Redmond	Processor/Buyer	Sambro
R. Murphy	Ind. Seafood Prod.	Yarmouth
E. Roe	Clearwater	Bedford

Provincial Government

A. Longard	N.S. Dept. of Fisheries	Halifax
B. Crawford	N.S. Dept. of Fisheries	Halifax
G. Mossman	N.S. Dept. of Fisheries	Bridgewater
D. Vardy	Nfld. Dept. of Fisheries	St. John's

Federal Government (DFO)

A. Clarke	Conservation & Prot.	Yarmouth
C. Jones	Resource Allocation	Halifax
B. Duggan	Conservation & Prot.	Barrington
R. Barnes	Conservation & Prot.	Liverpool
J. Porter	Science	St. Andrews
C. Thompson	Conservation & Protection	Sydney
L. Knight	Resource Allocation	St. John's
D. Tremblay	Resource Allocation	Quebec

Native Representation

Corey Francis	Native Council of N.S.	Truro
Alex Denny	Union of N.S. Indians	Sydney
Don Julian	Confed. of Mainland Micmacs	Truro
John Paul	Atlantic Policy Congress First Nation Chiefs	Amherst
Frank Palmater	NB Aboriginal Peoples Council	Fredericton
Peter Barlow	Union of N.B. Indians	Fredericton

ATLANTIC LARGE PELAGICS ADVISORY COMMITTEE

MEMBERSHIP PROFILE

FISHERMEN

Tuna

Commercial (one each per Tuna Management Area)

-	Quebec	-	Leroy Leggo
-	Gulf N.B.	-	Aurélien Mainville
-	P.E.I.	-	Ken Drake*
-	Gulf N.S.	-	Dan McDougall
-	Southwest N.S.	-	James Mood
-	St. Marg. Bay	-	Robert Conrad
-	Newfoundland	-	Gerard Chidley

Charter

-	PEI	-	Shirley Bennett
-	Newfoundland	-	Robert Murray

Offshore

- Paul Blades

Swordfish

Longline

-	Scotia-Fundy	-	Langille Dixon
-	Newfoundland	-	Craig Hussey

Harpoon

-	Scotia-Fundy	-	Frank d'Entremont

* 1 Fisherman designated on a per meeting basis by PEI Fishermen's Association

Shark

Offshore

-	Scotia-Fundy	-	Jay Lugar

FISHERMEN'S ASSOCIATIONS

Newfoundland Tuna Fishermen's Association
- Lester Petten

Maritime Fishermen's Union
- Michael Belliveau/Richard Nickerson

Eastern Fishermen's Federation
- Cliff Fanning

P.E.I. Fishermen's Association
- Rory McLellan

Assoc. des pêcheurs-propriétaires des Iles-de-la-Madeleine
- L.T. Poirier/Mike Gerrard

Assoc. des pêcheurs de thon de la Gaspésie
- Hugh Journeaux

SWNS Tuna Fishermen's Association
- Don Aldous

Nova Scotia Swordfish Association
- Eric Holmes

Newfoundland Fishermen Food and Allied Worker's Union
- Earle McCurdy

PROCESSOR/BUYER

-	Quebec	-	Hugh Journeaux
-	Gulf	-	Garth Jenkins
-	Scotia-Fundy	-	Roger Stirling
-	Newfoundland	-	Bud O'Brien

ICCAT COMMISSIONERS

- Sam Elsworth
- Walter Bruce

PROVINCIAL GOVERNMENTS

-	Quebec	-	Jean-Paul Lussiàa-Berdou
-	New Brunswick	-	François Mondo
-	P.E.I.	-	David Younker
-	Newfoundland	-	David Vardy
-	Nova Scotia	-	Alan Steel

FEDERAL GOVERNMENT

Chairman, Director, Resource Management Branch, Fisheries Management
- Barry Rashotte

Resource Management Branch, Ottawa/Regions
- Mike Calcutt
- Denis Tremblay
- Laurent Paulin
- Chris Jones
- Len Knight

Economic Commercial Analysis Division, Newfoundland
- Frank Corbett

Science Division, Tuna and Swordfish
- Julie Porter
- Bob O'Boyle

ATLANTIC LARGE PELAGICS ADVISORY COMMITTEE

TERMS OF REFERENCE

Purpose:

The purpose of the Atlantic Large Pelagics Advisory Committee (ALPAC) is to provide advice to the Department of Fisheries and Oceans on the management and development of the fisheries for tuna, swordfish, porbeagle shark and other large pelagic species of Atlantic Canada. In doing so it will replace the Atlantic Bluefin Tuna Advisory Committee (ABTAC) and Atlantic Swordfish Advisory Committee (ASAC).

Regional committees, similarly structured, will provide input to the Atlantic committee. Membership for the Atlantic committee will be drawn from those regional committees.

Scope:

The Committee will provide the opportunity for consultation between various parties with interest in or jurisdiction over the industry. Membership will include the federal government, provincial governments, fishermen and processors.

Advice from the various Regional Advisory Committees will be consolidated by the ALPAC.

The Committee will provide input on annual management plans which may include, but is not restricted to advice on: quota allocations, regulatory amendments, enforcement efforts, licensing policies, seasons, size limits, gear restrictions, the administration of enterprise allocation programs, allocation of foreign quotas and developmental activities.

The Committee will take into consideration biological, marketing and other relevant information when formulating it's advice.

Chairman:

The Committee chairmanship will be held by a Department of Fisheries and Oceans official.

Subcommittees:

Ad hoc subcommittees and/or working groups can be established to review and assess specific policy options and management measures.

.../2

Meetings:

Meetings will be held at the call of the Chairman and there will be not less than one meeting convened each year. Additional meetings may be necessary as determined by the Committee.

Meetings may be held in any of the participating Regions or at National Headquarters in Ottawa. When feasible, meetings will be held at times and places convenient to the membership.

Attendance:

If a member cannot attend, an alternate may be nominated and the Chairman notified as far in advance of the meeting date as possible.

The proceedings of the Advisory Committee meetings will be open to the public and media representatives unless a majority of Committee members say otherwise before a meeting starts. Observers will sit away from the table and not take part in discussions unless asked by the Chairman. Numbers of observers may be restricted, at the discretion of the Chairman, in a case of limited space in the meeting facility.

Administration:

Effective January 1, 1994, the Department will no longer reimburse expenses for attendance at meetings.

No formal voting procedures will be entrenched in the conduct of the Committee, but rather it will seek to operate on a consensus basis.

Summary results of each meeting will be prepared and distributed by the Department of Fisheries and Oceans.

Membership:

Membership of the Committee shall be made up of those industry sectors having major involvement in the harvesting and processing /marketing of the resource, as well as representatives of provincial governments and the Department of Fisheries and Oceans.

DEPARTMENTAL CONTACTS

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2

GREENLAND

Greenland's fishermen do not report catching any swordfish. The European Union (EU), however, reported importing three tons of swordfish from Greenland in 1992. There are no other reports of swordfish being caught or exported from Greenland.

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Fishing grounds

Greenland is located between the Arctic Ocean and the North Atlantic Ocean to the northeast of Canada. It is a large island of 2.2 million square km, or three times the size of Texas, but most of it is covered by a thick layer of ice. Greenland has a coastline of 44,087 km and claims an exclusive fishing zone of 200-nautical-miles. Fishing communities are scattered along the coast. Greenland is generally far removed from most swordfish fishing grounds, but it is possible that some swordfish could be caught while migrating from Ireland to Canada or up from the Caribbean beyond the normal Canadian fishing grounds.[64]

Fleet

The Greenlandic fishing fleet includes a variety of modern fishing vessels. Fishing conditions are harsh in the North Atlantic and well-built vessels are a necessity for survival. The Greenlandic fleet includes modern stern trawlers and shrimp trawlers that fish for deepsea pandalid shrimp. Longliners fish for cod and other species.

Shipyards

There are a few shipyards that can deal with local vessels located in the capital city of Nuuk.

Fleet operations and gear

Greenlandic fishermen do not fish for swordfish.

Catch

A. General

Greenland's fisheries have declined from 169,000 tons in 1989 to 114,000 tons in 1993. The decline in Atlantic cod harvests in recent years has resulted in the poor catches. Greenland has recently begun a fishery for large sharks together with an existing fishery for dogfish and it is possible that very small quantities of swordfish are being caught in this fishery.

B. Swordfish

Greenland reports no catches of swordfish. The EU, however, reported importing three tons of swordfish from Greenland in 1992. It is likely that this was an incidental catch associated with other fisheries, perhaps fisheries aimed at catching dogfish or large sharks.

Ports

The principal ports in Greenland include Faeringehavn, Frederikshaab, Holsteinsborg, Nanortalik, Narsaq, Nuuk (Godthaab), and Sondrestrom.

Transshipments

Greenlandic fishermen are not thought to be transshipping swordfish.

Processing and products

Companies in Greenland can produce fresh, frozen, dried, salted, smoked, and canned seafood items, as well as fishmeal and oil.

3

UNITED STATES

Karyl K. Brewster-Geisz

The United States swordfish fishery began in 1817 as a harpoon fishery off the coast of New England. Harpooning began on the west coast in the early 1900s. Longlining for swordfish (*Xiphias gladius*) began on the Atlantic in the 1960s, while longlining on the Pacific did not begin until the late 1980s. The average whole weight of Atlantic swordfish landed decreased from 120 kg in 1963 to 38 kg in 1989. The average whole weight of Pacific swordfish caught in the harpoon fishery is 113 kg, in the longline fishery is 98 kg, and in the recreational fishery is 107 kg. In the Atlantic, swordfish is caught along the entire coast, whereas in the Pacific swordfish is a target species only in California and Hawaii. In September 1985, a fishery management plan (FMP) went into effect for Atlantic swordfish, which is considered overfished. Pacific swordfish is still considered stable and healthy. The United States has been a member of ICCAT since May 14, 1966.

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Fishing grounds

The United States has a coastline of 19,924 km and an EEZ that ranges out to 200 nautical miles (nmi) off the coast. On the Atlantic coast (5,953 km), the fishery ranges from the Gulf of Mexico and Caribbean Sea, north of the five degrees north latitude, to the Canadian border. Most fishing occurs approximately 60 to 90 nmi off the Atlantic coast (along the Gulf Stream). On the Pacific coast (12,265 km), the majority of swordfish

fishing occurs off the coasts of California and Hawaii, although some swordfish are caught in waters off Oregon and Washington.

Species

A. Atlantic

The western north Atlantic broadbill swordfish spends the winters in the tropics. As the water turns colder, swordfish follow the Gulf Stream to waters off of New England and the Grand Banks along Newfoundland and Nova Scotia. Three spawning grounds have been identified: the Straits of Yucatan, the Straits of Florida, and the Lesser Antilles. Young fish generally remain in the spawning areas for the first few years of their lives. Migratory patterns may differ depending on age and sex.

B. Pacific

It is unknown whether the broadbill swordfish has any migratory patterns in the north Pacific. Of the nine recaptured swordfish, six were tagged and re-captured in the Southern California Bight, and three were tagged north of Hawaii and re-captured 549, 3,426, and 1,645 km away from the tagging area.[65] These these swordfish had all moved east toward California.

Fleet

A. Commercial

1. Atlantic

In 1985, there were approximately 340 commercial swordfish vessels in the Atlantic fishery. Of these, between 312 and 315 were longliners and only 25-to-28 were harpooners.[66] In 1995, there were at least 1,531 commercial vessels permitted to fish for Atlantic swordfish. The number of commercial vessels that caught at least one swordfish per year ranges from 416 in 1989 (the peak) to 273 in 1987. This number has remained at approximately 300 vessels since 1991.[67] Since the 1991 regulations that established a quota, only 12-to-15 vessels (out of 35 permitted vessels) participate in the Atlantic swordfish driftnet fishery.[68]

In 1990, some of the largest, most productive swordfish vessels in the Atlantic either moved to the Pacific or switched to the bigeye and yellowfin tuna fisheries.[69] Due to decreased catches in the Pacific, some of these vessels have moved back to the Atlantic.[70]

2. Pacific

a. California

In California, the harpoon fishery began in the early 1900s. The number of harpoon permits increased from 150 in 1978 to over 1,200 by 1980.[71] Despite the large number of permit holders, fewer than 300 vessels annually land harpooned swordfish. This number was exceeded in 1978 and 1980.[72] By 1993, the number of actively participating vessels had dropped to approximately 40.[73]

Photo 1.--Harpoon boat (left) at Terminal Island, California. William B. Folsom, NMFS-NOAA-DOC.

The California driftnet fishery began in the 1970s and targeted pelagic sharks. By 1980, driftnetters had begun to target swordfish.[74] In 1980, legislation limited the number of permits allowed in the driftnet fishery to 150, but those fishers already active in the fishery were exempt. In 1985, the number of permits reached a high of 300 permits, but less than 100 vessels actively fished throughout a season.[75] In 1993, 162 vessels reported landing swordfish in California. In 1994, 140 vessels fished in the driftnet fishery.[76]

The longline fishery did not exist in California until 1993. At this time, east coast swordfish fishers began to longline beyond the 200 nmi zone off the coast of California. By 1994, there were 30 California based swordfish longline vessels.[77]

b. Hawaii

In Hawaii, longlining for bigeye and yellowfin tuna began in the early 1900s. Recently, due to better technology, longliners have begun to target swordfish as well. The number of vessels permitted for longlining has increased from 37 in 1987 to 167 in 1994.[78] Permitted longliners target tuna, swordfish, or a combination of both. In 1996, there were 164 permitted vessels of which 105 were active. Of the 1,101 trips made in 1996, only 92 trips targeted swordfish.[79] This is down from 310 swordfish trips out of 1,107 total trips in 1994 and 136 swordfish trips out of 1,125 total trips in 1995.

B. Recreational

1. Atlantic

Prior to 1967, approximately 50 swordfish were caught annually with rod and reel in Massachusetts to Long Island waters.[80] By the late 1970s, this recreational fishery had spread all along the Atlantic coast and included annual tournaments in a number of coastal states. Currently, however, the Atlantic stocks are too low to support a viable recreational fishery.

2. Pacific

The Pacific recreational fishery is mostly a billfish fishery. Since 1971, this fishery has been allowed to use only rod and reel off the coast of California. Occasionally, a swordfish is caught. The annual average is three or four fish. Out of the 2,671 billfish reported recreationally in 1994 in the Pacific and Indian oceans, only eight were swordfish.[81] There is also a tagging program that reported the tagging of two swordfish in waters off of California and 66 in waters of off Hawaii in 1995.[82] The number of anglers participating in the Pacific recreational fishery is unknown.

Photo 2.--Longline vessel with bouys and spool in Honolulu, Hawaii. Dennis Weidner.

Shipyards

By 1989, the U.S. had over 200 shipyards located across most of the states.[83] Many of these are not geared for swordfish, although vessels built for other fisheries can be converted.

Fleet operations and gear

A. Atlantic

Until 1962, most Atlantic swordfish were caught with harpoons in waters between New York and Canada during the summer months. Harpooners need calm waters in order to see fins of the swordfish on the surface. Fin spotting was originally done from the crow's nest, but in the mid-1960s small aircraft became common spotters as they could cover more area and spot swordfish at greater depths.[84]

After 1962, longlines were introduced to Canada from Norway and to the U.S. from Japan.[85] U.S. fishers have since significantly modified fishing gear and methods. Longlines are set at night and hauled before daylight. Longliners use monofilament lines that are over 64 km long with 10-20 hooks per 1.6 km.[86] Chemical light sticks are attached near the baited hook to aid in attracting swordfish. Vessels use instruments to monitor location, water temperature, water movement and depth, to set locations, and distribute fishing information to other fishers. Floats and flags are used to support the line and facilitate retrieval.

In the early 1980s, New England fishermen began to use small driftnets to catch swordfish. This gear is now used all along the coast. Driftnets have a large mesh with an average of 56 cm stretch and have a maximum length of 2.5 km. These nets are set approximately 3.7 to 18.2 m below the surface at night with one end connected to the fishing vessel.[87]

B. Pacific

1. California

The Pacific swordfish fishery is conducted differently from the Atlantic fishery. For instance, the harpoon was the primary gear from the early 1900s to the 1980s. As with the harpoon fishery off the Atlantic, fishers search for a swordfish basking on the surface with binoculars or a spotter plane. Pacific harpoon vessels are 6-to-26 m in length with a 6-to-8 m bow plank.[88] When a fish is spotted, the plank is positioned above the swordfish and the harpoon thrown from the end of the plank. The fish is stored over ice for the rest of the trip. In the 1980s, the harpoon fishery was displaced by the driftnet fishery for pelagic sharks and swordfish. Many vessels have permits for both fisheries, setting their nets at night and harpooning during the day.[89]

The first Pacific driftnet vessels were converted from seabass, halibut and harpoon vessels (wooden or fiberglass hulls) which used ice to store fish.[90] These vessels remained near shore, but as the fishery expanded they were replaced by vessels with steel or aluminum hulls, larger hold space, more speed, and brine spray and blast freezers to store the fish. These vessels are capable of ranging further and staying out for about three weeks as opposed to a few days. When swordfish are brought on board they are dressed (head, fins, and guts removed), washed with sea water, and stored just above freezing. Currently, the California driftnet fishery catches swordfish mainly in waters off San Diego to San Francisco and within 500 km of shore.[91] Pacific driftnets are set four-to-10 m below the surface to allow boats and non-target species to swim over them. The net can fish as deep as 30 m and is usually set at sundown and retrieved after eight-to-12 hours. California has limited the length of the net to 1.8 km, the size of the mesh to a minimum of 40 cm, and the season to August 15 through January 31 of the following year.[92]

Swordfish taken with longlines were not seen in California until the 1990s. This was partly due to the restrictions placed by the California Fish and Game Commission (CFGC), which designated harpoons and driftnets as the only legal commercial swordfishing gear. In 1994, it was legal to land longlined swordfish in California but only if it was taken outside the EEZ.

2. Hawaii

In Hawaii, longlining began in 1917 with techniques brought over from Japan. Although longlining was used to catch tuna and billfish, swordfish longlining did not begin until the late 1980s. The first longlining boats were wooden vessels between 12 and 19 m long. The lines themselves were made of rope and flags were used to mark the gear. Steel and fiberglass

boats slowly began to enter the fishery in the 1950s.[93] By the early 1990s, new entrants into the fishery had steel vessels up to 33 m and were often former participants in east coast swordfish and tuna fisheries.[94]

Currently, the average swordfish boat is 22 m long, weighs 107 metric tons (mt), and makes 7.7 trips per year with an average of 18 travel days and 14 fishing days per trip.[95] Monofilament mainlines were introduced in 1985 and became popular by the end of 1990. Vessels targeting swordfish generally soak the gear overnight, attach light sticks to 50 percent or more of the branches, and fish for over three weeks at a time.[96] Swordfish longlines fish the upper 30-to-90 m of the water column.[97] Some longlining vessels target both swordfish and tuna. The longline is between 1 and 100 km long, and is supported at intervals by floats attached to vertical lines. There can be 2-to-25 branch lines ending in a baited hook between floats.

Photo 3.--Longliner fishermen preparing gear in Hawaii. Dennis Weidner.

Catch

In general, the U.S. fisheries provide 5.9 percent of the world's total marine and freshwater fish products, ranked fifth in the world for fish landings in 1993, ranked second in value for imports and exports of fish products, and contribute $25 billion annually to the nation's economy.[98] Total swordfish landings from the U.S. steadily increased from the 1950's to a peak of 11,215 tons in 1993 (table 10).

A. Atlantic

As with the total U.S. catch, swordfish catch has generally increased over time (table 10). Due to ICCAT recommendations, NMFS modified the regulations on the swordfish fishery in 1991. These regulations were reflected in a drop in the U.S. Atlantic landings from 5,519 tons in 1990 to 4,184 tons in 1993. In 1995, the U.S. catch in the North Atlantic amounted to 4,552 (including 526 tons of discards).[99] From 1961-1973, Atlantic swordfish reflected five- to 20-percent of the large pelagic catch in the U.S. harvest .[100] This increased to 60 percent in 1982 but is now down to 25 percent.

Longlining, which began on the Atlantic coast in 1963, increased U.S. swordfish catches dramatically; from 359 tons in the harpoon, driftnet, and rod and reel fisheries combined in 1962 to 1,053 tons in the longline fishery alone in 1963 (table 11). Currently, longlines are catching over 3,500 tons while harpoons, driftnets, and rod and reel gears are catching less than 150 tons combined.[101] Harpoon landings average less than 11.3 tons per year.[102] For the years 1970 to 1977, the U.S. longline fishery is listed as catching no swordfish on longlines.[103] This was due to strict mercury restrictions and may not be completely accurate.[104]

The average size of Atlantic swordfish has decreased over time. Between 1883 and 1895, the average whole weights in the Boston, MA, Portland, ME, and Gloucester, MA area were 120-to-187 kg.[105] At the turn of the century, the average whole weight was 136-to-181 kg where the largest was around 363 kg. The largest documented landing in the western north Atlantic occurred in 1921 in Boston. The fish weighed 415 kg, with a sword over 1.5 m, and a total length of 4.45 m.[106] In 1963, the average whole weight was 120 kg. Currently, the average whole weight of swordfish landed is 38 kg.[107]

In 1991, a minimum size limit regulation was set based on ICCAT recommendations. This drastically reduced the number of Atlantic swordfish landed that were under 125 cm fork length (fl; table 12) while increasing the number of discarded fish under 125 cm fl (table 13). Since 1988, the U.S. has reduced its fishing mortality on age 3+ fish by 18 percent, and reduced landings of

fish greater or equal to 125 cm fl by 31 percent in compliance with ICCAT recommendations.[108] The United States was the only country to follow ICCAT recommendations in 1991 and decrease the number of landings of Atlantic swordfish less than 125 cm fl; for age one swordfish, there was a 57 percent decline from 1988 to 1993.[109] Recent regulations removed the fifteen percent tolerance level for swordfish caught below the allowed minimum size in response to an alternative offered by ICCAT. Atlantic swordfish fisherman can no longer land swordfish that are under 15 kg or 73 cm cleithrum to caudal keel measure.

B. Pacific

1. Commercial

a. California

In the Pacific, the harpoon was the primary gear off the coast of California from the early 1900s to the 1980s. The average dressed weight of Pacific swordfish caught with a harpoon was 113 kg whole weight.[110] In the 1970s to 1980s catches by harpooners averaged 230 tons with a peak of 1,172 tons in 1978 (table 14).

The Pacific driftnet fishery dominated landings from 1983-1993. Average landings from 1981 to 1993 were 1,227 tons, with a high of 2,362 tons (25,725 swordfish) in 1985 and a low of 683 tons (7,771 swordfish) in 1991 (table 14).[111]

b. Hawaii

Pacific swordfish landings in Hawaii increased rapidly until 1993. In 1987, 22.7 tons of swordfish were caught. This increased to a high of 5,942 tons in 1993 and then decreased to 2,504 tons in 1996 (table 15).[112] This was a decrease of 58 percent. Swordfish composed 13.4 percent of the total longlining catch in Hawaii and 7.5 percent of the catch inside the EEZ.[113] The average whole weight of swordfish caught on longlines increased from 59 kg in 1987 to a peak of 81 kg in 1992.[114] Since that time this average weight has decreased. The average whole weight of swordfish landed in 1996 was 71 kg (table 16).[115] In 1996, there were 92 directed swordfish trips which caught 13,216 swordfish.[116] Out of the 1,101 trips (includes directed swordfish, directed tuna, and mixed trips), 38,243 swordfish were caught.

2. Recreational

The Pacific swordfish recreational fishery developed with the striped marlin fishery at the turn of the century. In 1931, California listed swordfish as a game fish and fishers were required to have a sport fishing license.[117] In 1971, when the CFGC limited the harpoon to commercial use only, recreational fishermen were limited to using rod and reel. Catching swordfish with a rod and reel is difficult. Even when a swordfish is spotted basking, it is difficult to get it to take the bait offered. The California recreational fishery catches only an average of three-to-four swordfish a year.[118] This catch peaked in 1978 with 127 swordfish reported for that year. The average whole weight of fish caught between 1981 and 1992 is 107.5 kg.[119]

Ports

A. Atlantic

There are estimated to be over 50 ports spread along the entire coast of the Atlantic and the Gulf of Mexico.[120] A few of the larger ports include:

Port Isabel, TX; Sabine Pass, TX; Galveston, TX; Dulac, LA; Venice, LA; Panama City, FL; Madeira Beach, FL; Destin, FL; Naples, FL; Key West, FL; Marathon, FL; Pompano Beach, FL; Fort Pierce, FL; Port Orange, FL; Cape Canaveral FL; Jacksonville, FL; Georgetown, SC; Charleston, SC; Wanchese, SC; Beufort, NC; Cape May, NJ; Barneget lake, NJ; Montauk, NY; Shinnecock, NY; New Bedford, MA; Gloucester, MA; Boston, MA; Portland, ME.

B. Pacific

In California, 85-to-90 percent of the swordfish are landed in 4 ports.[121] These ports are Santa Barbara, San Diego, Los Angeles

Harbor, and San Francisco. Smaller ports include Monterey Beach, Fort Bragg, and Crescent City. Fishers, however, often unload at whichever port is closest to them. In Hawaii, most of the swordfish is landed in Honolulu Harbor and Kewalo Basin.[122]

Transshipments

There are no known transshipments by U.S. fishermen operating out of U.S. ports.

Processing and products

U.S. seafood processors produced 4,549 tons of fresh or frozen swordfish worth $53.4 million in 1995. This included 2,920 tons of swordfish fillets worth $36.5 million and 1,629 tons of fresh or frozen swordfish steaks worth $16.9 million in 1995.[123] The 1995 production of 4,549 tons of fresh or frozen swordfish came from the U.S. catch of swordfish in the Atlantic Ocean (4,552 tons) and imports of 4,681 tons worth $31.9 million. Information on the U.S. catch of swordfish in the Pacific Ocean for 1994-95 was not available as this report was being completed.

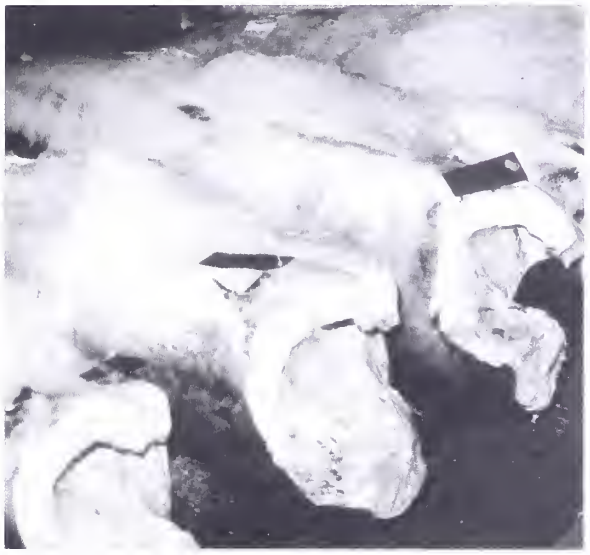

Photo 4.--Swordfish ready for processors. Dennis Weidner.

A. Atlantic

There are over 350 seafood processors along the Atlantic coast. Of these, approximately 50 are active in the swordfish fishery.[124] All U.S.-caught swordfish and most imported swordfish reach the processors fresh and dressed (no head, fins, tail or guts). There are occasions, however, when the processor is asked to provide a "display" fish with the head and tail intact. The processors cut the swordfish into loins or occasionally "wheels," also known as a round cut. A wheel is a cut between two vertebrae of the fish which leaves the bones intact. This forms a long cylinder. The processors interviewed agreed that most (95-98 percent) of U.S.-caught swordfish goes to U.S. markets.[125]

B. Pacific

In California, there were 90 seafood processors in 1995. Of these, five processed over 45,360 kg of swordfish.[126] Processors on the west coast receive, process, and sell the fish wholesale. As with processors on the east coast, they receive mostly fresh, dressed swordfish. However, unlike the east coast, there is a greater demand for fish weighing over 45 kg dressed weight (~60 kg whole weight), called marker fish, than for fish under 45 kg, called pups.[127] Processors usually cut the swordfish into loins but there is a growing trend of cutting the swordfish into 198-to-227 gram (g) steaks, called portion control.[128] Pacific processors distribute equally across the U.S. They also import fresh and frozen swordfish when the U.S. fisheries are closed.

Companies

A. Atlantic

In 1995, there were at least 1,531 permitted vessels in the Atlantic swordfish fishery. Of these, approximately 300 catch at least one swordfish a year. For the most part, each vessel is owned by a different individual entity. Currently, two entities own seven permitted vessels each, one company owns six permitted vessels each, five firms own 4 permitted vessels each, 18 entities own three permitted vessels each, and 108 companies own two vessels each.[129]

B. Pacific

The Pacific vessels are also owned by individual entities. In California, approximately 140 vessels were active in the driftnet fishery in 1994, approximately 40 vessels active in the harpoon fishery in 1993, and approximately 30 longliners in 1994. In Hawaii, there were 103 active longliners that exclusively fished for swordfish year-round in 1996. In Hawaii, several

boats have left the fishery or have sold their boats.[130]

Markets

A. Domestic

1. Atlantic

On the Atlantic coast, market prices vary depending on the size of the fish. A 27-kg fish is sold at $7.00 per kg and a 68-kg fish is sold at $11.00 per kg.[131]

2. Pacific

a. California

Most California swordfish is sold in local markets where the ex-vessel prices have ranged from $4.40 to $8.50 per kg since 1990.[132] The harpoon and driftnet California fisheries produced $4.0 million ex-vessel.[133]

b. Hawaii

In Hawaii, swordfish was the top gross revenue producer of any longline species from 1991 to 1994.[134] Ex-vessel revenue of swordfish increased from $170,000 in 1987 to a peak of $26,590,000 in 1993. This revenue declined to $13,460,000 in 1995.[135] Most Hawaiian swordfish is exported to the mainland, particularly to Boston, New York City, Los Angeles, and San Francisco, although local demand is rising.[136] The trends of ex-vessel prices for swordfish are opposite those for ex-vessels revenues. Ex-vessel prices have decreased from a high of $3.23 in 1987 to a low of $1.92 in 1992[137] and since increased to $2.49 in 1996.[138]

B. Imports

From 1971 to 1982, virtually no swordfish were imported due to the mercury restriction of 0.5 ppm. In 1978 this restriction was relaxed to 1.0 ppm and imports doubled from just under 80 tons in 1977 to 161 tons in 1978. By 1982, U.S. imports of swordfish had grown to just under 550 tons. The volume of imports doubled by 1984 when slightly more than 1,200 tons were imported. In 1985 imports reached 4,115 tons and this grew to a record 7,476 tons in 1990.[139] Imports declined to 5,140 tons in 1996.

In 1995, the United States imported 4,681 tons of swordfish valued at $31.9 million. This included 4,204 tons of fresh swordfish worth $28.9 million and 477 tons of frozen swordfish worth $3 million (Tables 17 and 18). In 1995, approximately 62 percent of total U.S. imports of swordfish came from countries bordering or fishing mostly in the Atlantic Ocean, 34 percent from nations operating from home ports in the Pacific Ocean (including distant-water fishing nations, such as Japan, Taiwan, and the Republic of Korea), and the remaining four percent from Indian Ocean countries.[140] The United States imported swordfish from 33 countries in 1995.[141] Canada was the principal supplier followed by Chile, Trinidad and Tobago, Mexico, Japan, and Uruguay (see table 16).

In 1996, the United States imported 5,139 tons of swordfish valued at $32.9 million from 29 different countries. This included 4,735 tons of fresh swordfish and 404 tons of frozen swordfish (table 19). The top 10 suppliers of swordfish in 1996, included: Chile, Costa Rica, Brazil, Canada, Uruguay, Mexico. Trinidad and Tobago, Singapore, Ecuador, and Taiwan. Singapore, Japan, Taiwan, Mexico, Spain, and Brazil were the leading exporters of frozen swordfish to the United States in 1996. It is noteworthy that Fiji, Malaysia, and even the Cook Islands and Tonga reported shipping fresh swordfish to the United States in 1996 (see table 19 for details).

Government policies

In the United States, the National Oceanic and Atmospheric Administration (NOAA) is responsible for living marine resources. The National Marine Fisheries Service (NMFS), an agency of NOAA, must follow a number of regulations which deal with the management of natural resources. These laws include the Magnuson-Stevens Fishery Conservation and Management Act (MFCMA), which regulates fisheries within the EEZ; the Endangered Species Act (ESA), which protects endangered or threatened species; and the Atlantic Tunas Convention Act (ATCA) which implements ICCAT recommendations.

Many States in the U.S., especially those along the Gulf of Mexico, are considering banning all driftnet fisheries. Florida, Texas, Georgia, Hawaii, Washington, and Oregon have banned or restricted the use of driftnets in coastal waters.[142]

Swordfish is also regulated by the Food and Drug Administration (FDA), which regulates any food product released for human consumption. In 1971, the FDA issued regulations restricting the amount of mercury found in all seafood to 0.5 ppm. Few swordfish could pass this criteria, but a few fishers continued to fish for swordfish. This restriction inhibited both domestic fisheries and imports. After a challenge in court, the mercury level was raised to 1.0 ppm in 1978.

Photo 5.--Swordfish being inspected for quality. Dennis Weidner

A. Atlantic

NMFS implemented the fishery management plan (FMP) for Atlantic swordfish in September 1985. Amendment 1 to this FMP was proposed in February 1997. The goals of the Atlantic swordfish FMP are to 1) enhance the economic value of the landings by reducing the harvest of small swordfish, 2) prevent or reduce growth overfishing and recruitment overfishing, 3) obtain scientific information for monitoring the fishery, 4) monitor and mitigate user group conflicts, and 5) minimize the impacts of foreign fishing on the domestic U.S. swordfish fishery. The original FMP arranged for 1) variable season closures and annual adjustments of the closures to achieve optimum yield, 2) procedures for evaluating and restricting specific fishing practices in the future, and 3) statistical reporting and procedures for altering data reporting. Logbook reporting is mandatory. The proposed Amendment 1 to the FMP would establish eligibility criteria for participation in the swordfish fishery based on historical participation and specify rules for transferability of fishery permits. The final Amendment 1 to the FMP is expected in the summer of 1997.

At the 1990 meeting, ICCAT, the Standing Committee on Research and Statistics (SCRS), recommended reducing the fishing mortality of North Atlantic swordfish weighing more than 25 kg by 15 percent from 1988 levels, and prohibiting the taking and landing of swordfish weighing less than 25 kg live weight (125 cm lower jaw fork length). In response to this, NMFS issued a ruling on June 12, 1991, that 1) established a minimum size limit of 78.7 cm dressed carcass length or 18.6 kg dressed weight with a 15 percent allowance for undersized Atlantic swordfish, based on the number of swordfish per trip, 2) set an annual quota divided equally between January 1 through June 30 and July 1 through December 31, 3) set a bycatch limit to two swordfish per trip unless the vessel contains harpoon gear where no bycatch is allowed, 4) prohibited sale of Atlantic swordfish caught in the recreational fishery and restricted recreational gear to rod and reel, and 5) provided for placing NMFS qualified observers on permitted vessels.

On June 4, 1996, in response to ICCAT recommendations, NMFS issued a rule for Atlantic swordfish that 1) reduced the total allowable catch (TAC) by 359 tons to 3,500 tons whole weight, 2) decreased the minimum size to 73 cm cleithrum to caudal keel measure (or 15 kg), 3) eliminated the trip allowance of undersized swordfish, 4) made reporting requirements consistent with the logbook program, and 5) changed the fishing seasons to June 1 through November 30 and December 1 through May 31.

B. Pacific

1. California

California regulates swordfish fishing in its own waters. Until the CFGC banned harpooning swordfish for sport in 1971, swordfish harpooning was both recreational and commercial. In 1973, CFGC declared the harpoon the only legal commercial

swordfish fishing gear. In 1980 the CFGC agreed to allow the driftnet fishery to land and sell swordfish but it also made this fishery a limited entry fishery and required observers. Driftnetters are required to report catches by species, date, geographical position, gear, set data, and permit numbers in logbooks. Logbook compliance is high (90 percent).[143]

In 1985, the inshore (up to 75 nmi from shore) driftnet fishing season was restricted to August 15 to January 31 in response to concerns of pelagic shark overfishing. Outside the 75 nmi limits, the season is restricted to May 1 to January 1. Within this shortened season, there are numerous time-area closures to protect marine mammals.[144]

In 1994, the CFGC began to allow longliners to land swordfish in California ports if the fish were taken outside the EEZ. In 1994, the CFGC also required all longliners operating from California ports to submit logbooks of daily activity.

2. Hawaii

In 1987, the Western Pacific Regional Fishery Management Council (WPRFMC) began requiring Hawaiian pelagic fishermen to report catches, number of hooks used, and number of light sticks used in logbooks, to obtain a fishing permit for longlining or experimental fishing, and to obtain a limited entry permit for longline gear holders. The WPRFMC also warned that observers might become mandatory in the future and prohibited driftnets in the fishery management area. The fishery management area includes the fishery conservation zone off the coasts of Hawaii, Samoa, Guam, and U.S. possessions in the western Pacific.

In 1991, the WPRFMC placed a moratorium on entry of longlining vessels into the fishery. One hundred sixty-seven western Pacific longline fishing permits to domestic vessels, of which 156 were Hawaii longline limited entry permits, were issued by the NMFS, Pacific Area Office, Southwest Region. In 1991, Federal regulations prohibited longline fishing within 50 nmi around the islands and banks of the Northwestern Hawaiian Islands to prevent interactions with the endangerd Hawaiian monk seal. Federal regulations also prohibited longline fishing within 50 to 75 nautical miles of the main Hawaiian Islands to prevent gear conflict with the smaller trolling and handline boats. Due to increasing concern that longliners were exceeding biological opinion levels in interacting with sea turtles, in 1994 the NMFS Southwest Region enacted a mandatory observer program to document interactions of longlines with protected animals such as turtles.[145]

Research

In the Atlantic, much of the research seeks to increase the understanding of the effect of fishing on the north Atlantic/Mediterranean management units.[146] The DNA of Atlantic, Pacific, and Mediterranean stocks is being studied in order to prove or disprove the one stock hypothesis. Studies have shown that for the most part these three stocks operate independently of each other but some exchange of genetic material between the Atlantic and Mediterranean stocks does occur .[147]

The U.S. cooperative tagging program database shows that 6,923 Atlantic swordfish have been tagged since 1940 (most since 1960), and 193 have been recaptured.[148] These data show that swordfish are capable of traveling long distances. In 1995, the first documented trans-Atlantic movement of swordfish was recorded. The tagged swordfish traveled 2,732 nmi from Wilmington Canyon to Spain in 390 days.[149] The data are also used to show the growth rate of swordfish by using weight, length, and number of days between release and recapture. These growth rates fluctuated greatly for fish recaptured within a year and a half.[150]

On the Pacific, there is a cooperative tagging program for billfish anglers. Since the beginning of this program in 1964, anglers have tagged 453 swordfish and recaptured nine. These studies show that Pacific swordfish travel large distances and may have migratory patterns.[151] More research is needed in order to ensure the continuation of a healthy and stable stock. Testing of pop-up satellite transmitting archival tags is being performed to ascertain temporal and spatial patterns.[152] Other studies are attempting to use remote sensing and DNA to determine the migrations

and population structures of swordfish

Although the number of small Atlantic swordfish landed in the U.S. has dropped dramatically since 1991 (table 12), the number of small swordfish discarded has increased (table 13). Research is now being done to analyze the percentage of small swordfish that is discarded dead. This mortality is not reported by the vessels but is recorded by observers.[153] Estimates of dead discards were consistently higher than reported and may be as high as 28,945 fish.[154]

Other research includes a reproductive study, a sex ratio studies, spatial dynamic studies, a trophic dynamic study, and an ageing study. The reproductive study is attempting to estimate female fecundity by analyzing gonadal index values.[155] Currently, there is not enough data for accurate results. The sex ratio project hopes to provide a more accurate means of assessing the stock and estimating the age of the fish caught,[156] and, in the Pacific, reserachers hope to determine the size structure by sex and the size at 50 percent maturity.[157] Both studies are difficult as male and female swordfish grow at different rates and to different maximum sizes. Ageing studies are attempting to use growth zonations found in finrays and otoliths to estimate age.

Bycatch

Sharks, tuna, and billfish are often caught in swordfish longlining operations (both domestic and foreign). Swordfish is caught on shark and tuna longlines as well as in squid trawls. Marine mammals, sea turtles, and seabirds are often caught in swordfishing gear. Any protected or endangered species caught must be released regardless of its condition. Unlike the other gears, there is no incidental catch in the harpoon fishery.

A. Atlantic

In the Atlantic driftnet fishery (tuna, shark or swordfish), tunas such as albacore (*Thunnus alalunga*), yellowfin (*T. albacares*), and bigeye (*T. obesus*), and sharks such as blue (*Prionace glauca*), scalloped hammerhead (*Sphyrna lewini*), mako (*Isurus* sp.), porbeagle (*Lamna nasus*), and sandbar (*Carcharhinus plumbeus*) are often caught and retained.[158] Before the shark FMP in 1993 that prohibited "finning", sharks were usually landed as fins. Tunas, sharks, and other bony fish which are caught and released include little tunny (*Euthynnus alletteratus*), skipjack (*E. pelamis*), Atlantic bonita (*Sarda sarda*), bluefin tuna (*T. thynnus*), sunfish (*Mola* sp.), bigeye thresher (*Alopias superciliosus*), dusky (*C. obscurus*), basking (*Cetorhinus maximus*), tiger (*Galeocerdo cuvieri*), Batoids sp., remoras, Echeneidae, blue marlin (*Makaira nigricans*), and white marlin (*Tetrapturus albidus*). The driftnet fishery also catches and releases a variety of cetaceans, sea turtles, and sea birds including bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), humpback whale (*Megaptera novaeangliae*), pilot whale (*Globicephala* sp.), right whale (*Eubalaena glaciales*) sperm whale (*Physeter macrocephalus*), loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), and shearwater (*Puffinus* sp.).[159] This fishery has an average rate of approximately 34 seriously injured or killed marine mammals every 20 days.[160]

The Atlantic longline fishery (shark, tuna, and swordfish) has an average rate of seriously injuring or killing 0.045 marine mammals every 20 days.[161] In 1992 and 1993, 887 leatherbacks and 536 loggerheads turtles (includes hawksbill, green, Kemp's ridley) were captured, but only one leatherback and two loggerheads were killed.[162]

B. Pacific

1. California

In California, shark landings are a significant product of the driftnet fishery.[163] In fact, sharks dominated the catch prior to 1983 but have decreased from approximately 1000 tons to 500 tons. Incidental catch of marine mammals in California was considered high in the first years of the driftnet fishery.[164] In 1980, observer programs and time area closures were mandated to address this issue. Currently, bycatch of some marine mammals, such as sea lions, or other species is not considered a problem in the California swordfish fishery. However, the bycatch of other marine mammals, such as whales, is considered a problem by many. The rate of seriously injuring or killing marine mammals in this fishery is 3.2 every 20 days.[165]

2. Hawaii

Hawaiian longlining vessels (swordfish, tuna, and mixed) also report incidental catches. In 1996, 35 different vessels, in a total of 76 trips, reported 406 interactions with protected species.[166] Seabird interactions are the most frequent and have a high mortality rate. In 1996, 301 interactions with seabirds (277 of which were albatrosses) occurred; 84 percent of these were released dead, seven percent released injured, and nine percent released alive.[167] Turtle interactions were the second most frequent type of interaction but have a much lower mortality rate than those with seabirds. In 1996, a total of 88 interactions were reported: 18 with leatherbacks, 28 with loggerheads, 11 with green, and 23 with an olive ridley. Eighty-nine percent were released alive.[168] There were also 17 interactions with cetaceans (four false killer whales, one with other whales, and 12 with dolphins). All, but one cetacean, were released alive.[169]

International relations

A. Atlantic

The United States is one of 24 members of ICCAT. The Commission is responsible for providing internationally coordinated research on the condition of the Atlantic tunas and tuna-like species, and their environment, as well as for the development of regulatory harvest recommendations for consideration by the Convention Parties. The objective of such regulatory recommendations is to conserve and manage tuna and tuna-like species throughout their range in a manner which achieves the maximum sustainable catch. Regulatory proposals adopted by the Commission are submitted to governments for acceptance. These recommendations become effective for all Parties within approximately six months (unless otherwise stated) provided objections are not made during that period by concerned Contracting Governments. Each Party to the Convention has the responsibility for implementing and enforcing the Commission's recommended conservation measures. Under the terms of the Atlantic Tunas Convention Act (16 U.S.C. 971 et seq.), the United States is obligated to promulgate regulations to implement recommendations adopted by ICCAT and accepted by the U.S.

The Commission has taken conservation and management actions for several of the species under its purview, including Atlantic swordfish. Recommendations aimed specifically at Atlantic swordfish were agreed on at the 1990 ICCAT meeting and came into force in 1991. These recommendations established such things as catch reductions, catch limitations, and minimum size restrictions.

One specific measure called for a prohibition on the taking and landing of swordfish weighing less than 25 kg, but allowing Contracting Parties to grant a 15-percent tolerance of small fish. The 15 percent small fish tolerance made it difficult for the United States and others to enforce the minimum size and, thus, to ensure the effectiveness of a minimum size as a conservation measure. ICCAT's SCRCS reported that a lower minimum size prohibition with no tolerance could be used as the functional equivalent (in terms of fishing mortality) of the 25-kg minimum size with tolerance. Therefore, in an effort to protect small swordfish, the Commission adopted a recommendation at its 1995 annual meeting that allows Contracting Parties to select an alternative swordfish minimum size of 119 cm from the tip of the lower jaw to the fork of the tail, or the equivalent in weight, with no tolerance. The recommendation specifies that any Contracting Party that adopts this alternative minimum size may take the necessary measures to prohibit the landing and sale in its jurisdiction of swordfish and swordfish parts below the alternative minimum size.

In 1994, data were supplied indicating that current harvest levels were above replacement yield in the North Atlantic. Country quotas were set for all major swordfish harvesters in the North Atlantic. The United States and Spain, the largest harvesters, were allotted 3,970 tons and 6,230 tons, respectively, in 1995; and 3,500 tons and 5,500 tons, respectively, in 1996.

At its 1995 annual meeting, ICCAT established a long-term sharing arrangement for North Atlantic swordfish that provided quota underages could be carried over to following year and quota overharvests would be deducted from

the following year's quota. The scheme allots the following percentages beginning in 1997: (1) Canada - 10 percent, (2) Japan - 6.25 percent, (3) Portugal - 7.5 percent, (4) Spain - 41.25 percent, (5) United States - 29 percent, and (6) Others - 6 percent.

At the 1996 ICCAT meeting, TACs were established for 1997-to-1999. These TACs represent a decrease from past levels and a second consecutive quota reduction for the Atlantic swordfish fishery. TAC reductions were necessary to address the decline in the North Atlantic swordfish stock and to prepare the way for rebuilding. The U.S. share of the TAC is 3,277 MT for 1997, 3,190 MT for 1998, and 3,103 MT for 1999. The U.S. quota in 1996 was 3,500 MT. The impact of the quota reductions on the U.S. fishery is partially offset by the increased share allotted to the United States under the 1995 sharing arrangement.

ICCAT adopted an historic recommendation at its 1996 annual meeting that establishes a three-step process designed to address issues of non-compliance with catch limits by Contracting Parties for North Atlantic swordfish and Atlantic bluefin tuna. The first step in the process requires that Contracting Parties explain to ICCAT any over-harvest as well as any planned or implemented actions intended to rectify the problem. The second step provides that, beginning in 1998, 100 percent of any quota over-harvest will be deducted from a nation's catch limit for the subsequent management period. The third step provides that, for any nation that exceeds its catch limit during any two consecutive management periods, the Commission will recommend appropriate measures, which may include, but are not limited to, reduction in the catch limit equal to a minimum of 125 percent of the excess harvest, and, if necessary, trade restrictive measures.

B. Pacific

The U.S. is a member of a number of international commissions concerned with tuna and tuna-like species in the Pacific. Once such group is the Inter-American Tropical Tuna Commission (IATTC). Other members of this group are Costa Rica, France, Japan, Nicaragua, Panama, Vanuata, and Venezuela. The Tuna Conventions Act of 1950 (16 U.S.C., 951-961) provides that the U.S. will be represented by four Commissioners in the IATTC. The Commissioners are appointed by the President. The Act also provides that the U.S. Commissioners must appoint an Advisory Committee of 5-to-15 persons. The Advisory Committee may attend all non-executive meetings and may be heard on all proposed programs reports, recommendations, and regulations of the Commission. The purpose of the IATTC is to study the effects of fishing and environmental factors on the abundance of tuna and related species in the East Pacific Ocean and to recommend conservation measures which will maintain the stocks at a level capable of producing a maximum sustainable catch. In order to fulfill its mission, IATTC employs a permanent research staff.

The North Pacific Marine Science Research Organization (PICES) is another group concerned with tuna and tuna-like species. Members include the U.S., Canada, Japan, China, the Republic of Korea, and the Russian Federation. The U.S. is represented on the PICES Governing Council by two persons who are appointed by the Secretary of State, and is represented on the Scientific Committees and Working Groups by interested persons appointed by the Secretary of State. This group attempts to coordinate both research efforts undertaken by its members and the exchange of scientific information. Its focus is on the understanding of the biological and oceanographic processes of the North Pacific Ocean.

The U.S. is also a member in the Interim Scientific Committee for Tuna and Tuna-like species (ISC) which has placed swordfish, bigeye tuna, and northern bluefin tuna on its priority list.[170] As this group is newly formed (first meeting held in May 1996) the administrative rules and procedures have not yet been formalized. Currently, the members also include the Japan, Canada, China, the Republic of Korea, Mexico, and Chinese Taipei. Both IATTC and PICES are participating, but not voting, members. At the first meeting, it was proposed to expand membership to include all coastal fishing nations in the north Pacific including Indonesia, Philippines, Federated States of Micronesia, the Marshall Islands, Kiribati, and Palau. However, this will not happen until the rules and processes

are formalized. The next meeting is planned for 1998. This group was formed to assess and monitor the species and fisheries of interest.

Future trends

A. Atlantic

The U.S. is proposing to limit access to the commercial Atlantic swordfish fishery. This fishery currently has a quota and minimum sizes per ICCAT recommendations. The addition of limited access to the fishery should decrease the number of permitted vessels significantly. However, as only 300 vessels catch at least one swordfish each year, the onset of limited access may not significantly reduce the number of active vessels. The discard amount of Atlantic swordfish has increased in the past few years (table 11, 13). Unfortunately, most of the discards (85-to-91 percent) consisted of swordfish less than 125 cm fl. The removal of the fifteen percent tolerance level of swordfish under the new minimum size could affect the discard rate. Recent years have shown a decrease in the quota. This trend is expected to continue. With a decrease in quota, the markets will likely need to supplement the demand for swordfish with Pacific or imported swordfish. With the increasing concern for driftnets, it is expected that the use of driftnets will decrease. The use of harpoons, the traditional fishing gear, and the recreational fishery may continue to decrease until the stocks begin to rebuild.

B. Pacific

On the Pacific, recent landings have stayed relatively stable for the past few years. However, with decreasing quotas on the east coast, the demand for swordfish in the Pacific may increase. This extra demand may cause an increase in Pacific landings and effort. As on the east coast, it is not expected that the use of driftnets to increase. The use of harpoons may decrease as increased fishing effort catches more of the older, larger swordfish.

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APPENDIX SECTION

APPENDIX SECTION

PART I. STATISTICAL TABLES

Table 1. NORTH AMERICA--Swordfish catch, by Canada and the United States* in the North Atlantic Ocean, 1950-94.

Year	Canada			United States				Total
	Longline	Other gear	Total	Longline	Other gear	Discards	Total	
	Metric Tons							
1950	0	1,290	1,290	0	911	0	911	2,201
1951	0	1,523	1,523	0	92	0	92	1,615
1952	0	1,890	1,890	0	137	0	137	2,027
1953	0	1,990	1,990	0	110	0	110	2,100
1954	0	2,573	2,573	0	156	0	156	2,729
1955	0	2,722	2,722	0	161	0	161	2,883
1956	0	2,761	2,761	0	223	0	223	2,984
1957	0	3,102	3,102	0	366	0	366	3,468
1958	0	3,219	3,219	0	710	0	710	3,929
1959	0	4,014	4,014	0	690	0	690	4,704
1960	0	2,328	2,328	0	458	0	458	2,786
1961	0	1,913	1,913	0	406	0	408	2,321
1962	311	1,781	2,092	65	359	0	424	2,516
1963	6682	800	7,482	1,053	197	0	1,250	8,732
1964	6888	211	7,099	1,279	105	0	1,384	8,483
1965	4155	519	4,674	945	282	0	1,227	5,901
1966	3731	702	4,433	534	90	0	614	5,047
1967	4534	260	4,794	340	137	0	474	5,268
1969	4342	51	4,393	180	94	0	274	4,667
1969	4149	108	4,257	93	77	0	170	4,427
1970	4800	0	4,800	0	287	0	287	5,087
1971	0	0	0	0	35	0	35	35
1972	0	0	0	0	246	0	246	246
1973	0	0	0	0	406	0	406	406
1974	2	0	2	0	1,125	0	1,125	1,127

1975	21	0	21	0	1,700	0	1,700	1,721
1976	15	0	15	0	1,429	0	1,429	1,444
1977	113	0	113	0	912	0	912	1,025
1978	2,314	0	2,314	3,020	664	0	3,684	5,998
1979	2,970	0	2,970	3,888	731	0	4,619	7,589
1980	1,794	91	1,885	5,015	610	0	5,625	7,510
1981	542	19	561	3,986	544	0	4,530	5,091
1982	542	12	554	5,271	139	0	5,410	5,964
1983	960	128	1,088	4,510	310	0	4,820	5,908
1984	465	34	499	4,666	83	0	4,749	5,248
1985	550	35	585	4,642	63	0	4,705	5,290
1986	973	86	1,059	5,143	67	0	5,210	6,269
1987	876	78	954	5,164	83	0	5,247	6,201
1988	874	24	898	6,020	151	0	6,171	7,069
1989	1,097	150	1,247	5,855	556	0	6,411	7,658
1990	819	92	911	4,967	552	0	5,519	6,430
1991	953	73	1,026	4,184	126	247	4,557	5,583
1992	1,487	60	1,547	3,741	111	383	4,235	5,782
1993	2,206	28	2,234	3,668	109	408	4,185	6,419
1994	1,654	22	1,676	3,252**	114**	708	4,074	5,750
1995	1,409	201	1,610	3,927	99	526	4,552***	6,162

* Greenland reports no landings of swordfish. ** The *National Report of the United States*, SCRS/96/156[rev], has revised the reported catch for 1994. The new numbers are 4,074 tons total catch (including 3,252 tons longline, 114 tons other gear, and 708 tons discards). Data for 1995 includes "other gear" under the category of longline catch. *** U.S. data does not agree with data provided by the FAO in an unpublished report; the FAO reports the 1995 harvest by the United States as 5,916 tons, a difference of 1,364 tons.

Source: ICCAT, *Collective Volume of Scientific Papers,* Volume XLIV (3), 1994 SCRS, Madrid, Spain, 1995, pp.58 and 61 and ICCAT, Report of the Standing Committee on Research and Statistics, Fourteenth Regular Meeting of the Commission, Madrid, November 10-17, 1995, COM/95/25, Madrid, 1995, data for 1994 (and some modifications for earlier years), and Julie M. Porter, personal communications (1995).

Table 2. CANADA--Swordfish catch, by type of gear, 1950-94.

Year	Harpoon	Longline	Total	Year	Harpoon	Longline	Total
	Metric Tons				*Metric Tons*		
1950	1,290	0	1,290	1973	0	0	0
1951	1,523	0	1,523	1974	0	2	2
1952	1,890	0	1,890	1975	0	21	21
1953	1,990	0	1,990	1976	0	15	15
1954	2,573	0	2,573	1977	0	113	113
1955	2,722	0	2,722	1978	0	2,314	2,314
1956	2,761	0	2,761	1979	0	2,970	2,970
1957	3,102	0	3,102	1980	91	1,794	1,885
1958	3,219	0	3,219	1981	19	542	561
1959	4,014	0	4,014	1982	12	542	554
1960	2,328	0	2,328	1983	128	960	1,088
1961	1,913	0	1,913	1984	34	465	499
1962	1,781	311	2,092	1985	35	550	585
1963	800	6,682	7,482	1986	86	973	1,059
1964	211	6,888	7,099	1987	78	876	954
1965	519	4,155	4,674	1988	24	874	898
1966	702	3,731	4,433	1989	150	1,097	1,247
1967	260	4,534	4,794	1990	92	819	911
1969	51	4,342	4,393	1991	73	953	1,026
1969	108	4,149	4,257	1992	60	1,487	1,547
1970	0	4,800	4,800	1993	28	2,206	2,234
1971	0	0	0	1994	22	1,654	1,676
1972	0	0	0	1995	201	1,409	1,610

Sources: John Hoey, et. al., "An Updated Biomass Index of Abundance for North Atlantic Swordfish,"ICCAT, *Collective Volume of Scientific Papers,* Volume XLIV (3), 1994 SCRS, Madrid, Spain, 1995, p. 191 (data for 1958-64) and ICCAT, *Report of the Standing Committee on Research and Statistics* (SCRS), Fourteenth Regular Meeting of the Commission, Madrid, November 10-17, 1995, COM/95/25, (data for 1965-94) and Julie M. Porter, personal communications (1995).

Table 3. CANADA--Swordfish catch, by region, quantity, and value, 1980-94.

Year	Nova Scotia		New Brunswick		Prince Edward Island		Quebec		Newfoundland		TOTAL	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	M.T.	*C$1,000*	*M.T.*	*C$1,000*	*M.T.*	*C$1,000*	*M.T.*	*C$1,000*	*M.T.*	*C$1,000*	*M.T.*	*C$1,000*
1980	1,885	4,170	0	0	0	0	0	0	0	0	1,885	4,170
1981	577	1,256	0	0	0	0	0	0	0	0	577	1,256
1982	943	2,633	0	0	0	0	0	0	0	0	943	2,633
1983	1,065	3,416	0	0	0	0	0	0	0	0	1,065	3,416
1984	539	2,551	0	0	0	0	0	0	0	0	539	2,551
1985	573	2,894	0	0	0	0	0	0	0	0	573	2,894
1986	1,061	7,112	0	1	0	0	0	0	0	0	1,061	7,113
1987	948	6,685	0	0	0	0	0	0	7	24	955	6,709
1988	972	6,041	0	0	0	0	0	0	13	95	985	6,136
1989	1,249	7,216	0	0	0	0	0	0	15	106	1,264	7,322
1990	909	5,253	0	0	0	0	0	0	3	16	912	5,269
1991	1,027	6,823	0	0	0	0	0	0	0	1	1,027	6,824
1992	1,487	10,971	0	0	0	0	0	0	56	279	1,543	11,250
1993	2,072	15,090	0	0	0	0	0	0	155	778	2,227	15,868
1994	1,542	13,074	0	0	0	0	0	0	133	976	1,675	14,050
1995	1,542	13,018	0	0	0	0	0	0	68	577	1,610	13,595

Laurette Gagnon, Statistical Services, Department of Fisheries and Oceans, Ottawa, Ontario, Canada.

Table 4. CANADA--Number of active licenses, swordfish landings, average weight, and percentage of small fish, 1988-94.

Year	Active Fishing Licenses		Catch			Average weight	
	Longline	Harpoon	Longline	Harpoon	Total	Longline	Harpoon
	Number		*Metric Tons*			*Kilograms*	
1988	39	n.a.	887	24	911	50	0
1989	52	n.a.	1,097	146	1,243	52	129
1990	50	n.a.	819	92	911	61	138
1991	53	61	953	73	1,026	61	78
1992	46	72	1,486	60	1,546	57	67
1993	75	72	2,206	28	2,234	56	129
1994	74	32	1,654	22	1,676	63	120
1995	75	97	1,421	188	1,609	68	122

Julie M. Porter and C.J. Allen, *National Report of Canada, 1995*, ICCAT, National Reports, COM-SCRS/96/44, Madrid, 1996, p. 7 and Julie M. Porter, personal communications.

Table 5. CANADA--Swordfish longline fishing license distribution, by region, 1980-1994.

REGION	Active	Total
1994:		
Newfoundland	5	5
Scotia-Fundy	69	69
Offshore	0	0
Total 1994	74	74
1995:		
Newfoundland	11	11
Scotia-Fundy	66	66
Offshore	0	0
Total 1995	77	77

Julie M. Porter and C.J. Allen, *National Report of Canada, 1995*, ICCAT, National Reports, COM-SCRS/96/44, Madrid, 1996, p. Note: Active fishermen are those that picked up their licenses, license conditions, and tags. They may, or may not have actuallyed fished for swordfish.

Table 6. CANADA--Exports of fresh swordfish, to the United States and total exports, by quantity and value, 1980-96.

Year	United States		Total Exports	
	Quantity	Value	Quantity	Value
	Metric Tons	*C$1,000*	*Metric Tons*	*C$1,000*
1980	192	949	192	949
1981	15	47	15	47
1982	0	0	0	0
1983	166	1,093	166	1,093
1984	202	1,578	202	1,578
1985	363	2,399	363	2,400
1986	744	7,537	744	7,537
1987	344	4,008	344	4,008
1988	n.a.	n.a.	n.a.	n.a.
1989	457	3,686	459	5,110
1990	562	5,012	567	5,012
1991	731	6,605	735	6,678
1992	1,133	11,208	1,136	11,240
1993	1,746	18,091	1,746	18,098
1994	1,232	16,024	1,232	16,024
1995	1,258	16,555	1,258	16,555
1996	533	5,625	533	7,788

Sources: Fisheries and Oceans, *Canadian Fisheries International Trade, December 1996*, Volume 18, No. 4, Economic Analysis and Statistics Division, Ottawa, Canada, 1996 (data for 1995-95), Fisheries and Oceans, *Canadian Fisheries International Trade, December 1990-94*, Volume 12, No. 12, Economic Analysis and Statistics Division, Ottawa, Canada, various years (data for 1989-94) and Fisheries and Oceans, *Canadian Fisheries Annual Statistical Review*, various years, Economic Analysis and Statistics Division, Ottawa, Canada, various years (data for 1984).

Table 7. CANADA--Exports of swordfish, to the United States, 1975-96.

Year	Product Form		Total Exports
	Fresh	Frozen	
	Metric Tons		
1975	0	0	0
1976	0	0	0
1977	0	0	0
1978	9	0	9
1979	2	0	2
1980	114	7	121
1981	2	0	2
1982	0	0	0
1983	233	4	237
1984	114	33	229
1985	401	1	402
1986	822	9	831
1987	444	3	447
1988	347	29	376
1989	538	1	539
1990	562	5	567
1991	731	23	754
1992	1,133	2	1,135
1993	1,746	0	1,746
1994	1,232	3	1,235
1995	1,258	0	1,258
1996	533	0	533

Source: U.S. Bureau of the Census import data.

Table 8. CANADA--Swordfish harvests and exports, by quantity and value, 1980-1994.

Year	CATCH		EXPORTS	
	Quantity	Value	Quantity	Value
	Metric Tons	*C$1,000*	*Metric Tons*	*C$1,000*
1980	1,885	4,170	192	949
1981	577	1,256	15	47
1982	943	2,633	0	0
1983	1,065	3,416	166	1,093
1984	539	2,551	202	1,578
1985	573	2,894	363	2,400
1986	1,061	7,113	744	7,537
1987	955	6,709	344	4,008
1988	911	6,709	306	2,927
1989	1,243	3,903	459	3,726
1990	911	3,812	567	5,012
1991	1,026	4,906	735	6,678
1992	1,546	11,000	1,136	11,249
1993	2,234	15,000	1,746	18,098
1994	1,676	14,050	1,232	16,024
1995	1,610	n.a.	1,258	16,555
1996	n.a.	n.a.	533	7,788

Fisheries and Oceans, *Canadian Fisheries Annual Statistical Review*, various years, Economic Analysis and Statistics Division, Ottawa, Canada, various years.

Table 9. UNITED STATES--Imports of fresh and frozen swordfish (dressed weight) from Canada, 1975-96.

Year	FRESH		FROZEN		TOTAL	
	Quantity	Value	Quantity	Value	Quantity	Value
	Metric Tons	*US$1,000*	*Metric Tons*	*US$1,000*	*Metric Tons*	*US$1,000*
1975	0	0	0	0	0	0
1976	0	0	0	0	0	0
1977	0	0	0	0	0	0
1978	9	0	0	0	9	0
1979	2	0	0	0	2	0
1980	114	320	7	16	121	336
1981	2	7	0	0	2	7
1982	0	0	0	0	0	0
1983	232	1,200	4	16	236	1,216
1984	196	1,156	33	154	229	1,310
1985	401	1,966	2	8	403	1,974
1986	822	6,101	9	37	831	6,138
1987	444	3,414	3	17	447	3,431
1988	347	2,641	29	154	376	2,794
1989	538	3,863	1	4	539	3,867
1990	562	4,290	5	61	567	4,351
1991	731	5,731	23	118	754	5,849
1992	1,133	9,054	2	27	1,135	9,081
1993	1,746	13,571	0	1	1,746	13,572
1994	1,232	11,544	3	27	1,235	11,571
1995	1,258	12,874	0	0	1,258	12,874
1996	533	5,625	0	0	533	5,625

TSUSA Codes: Fresh swordfish: 0302692040 and frozen swordfish: 0303792040. Source: U.S. Bureau of the Census.

Table 10. UNITED STATES--Swordfish catch, by fishing gear and ocean, 1950-95.

Year	Pacific Ocean			Atlantic Ocean				Total
	Hawaii Longline	California driftnet & harpoon	Total	Longline	Other gear	Discards	Total	
	Metric Tons							
1950	0	0	0	0	911	0	911	911
1951	0	0	0	0	92	0	92	92
1952	0	0	0	0	137	0	137	137
1953	0	0	0	0	110	0	110	110
1954	0	0	0	0	156	0	156	156
1955	0	0	0	0	161	0	161	161
1956	0	0	0	0	223	0	223	223
1957	0	0	0	0	366	0	366	366
1958	0	0	0	0	710	0	710	710
1959	0	0	0	0	690	0	690	690
1960	0	0	0	0	458	0	458	458
1961	0	0	0	0	408	0	408	408
1962	0	0	0	65	366	0	424	424
1963	0	0	0	1,053	197	0	1,250	1,250
1964	0	0	0	1,279	408	0	1,384	1,384
1965	0	0	0	945	282	0	1,227	1,227
1966	0	0	0	534	80	0	614	614
1967	0	0	0	945	137	0	474	474
1969	0	0	0	180	80	0	274	274
1969	0	0	0	93	77	0	170	170
1970	0	429	429	0	287	0	287	716
1971	0	70	70	0	35	0	35	105
1972	0	121	121	0	246	0	246	367
1973	0	278	278	0	408	0	406	684
1974	0	295	295	0	1,125	0	1,125	1,420

1975	0	393	393	0	1,700	0	1,700	2,093
1976	0	38	38	0	1,429	0	1,429	1,467
1977	0	232	232	0	912	0	912	1,144
1978	0	1,181	1,181	3,020	664	0	3,684	4,865
1979	0	266	266	3,888	731	0	4,619	4,885
1980	0	543	543	5,015	610	0	5,625	6,168
1981	0	518	518	3,986	544	0	4,530	5,048
1982	0	767	767	5,271	139	0	5,410	6,177
1983	0	1,182	1,182	4,510	310	0	4,820	6,002
1984	0	2,013	2,013	4,666	83	0	4,749	6,762
1985	0	2,362	2,362	4,642	63	0	4,705	7,067
1986	0	1,749	1,749	5,143	67	0	5,210	6,959
1987	23	1,246	1,269	5,164	83	0	5,247	6,516
1988	23	1,129	1,152	6,020	151	0	6,171	7,323
1989	281	1,296	1,577	5,855	556	0	6,411	7,988
1990	1,900	851	2,751	4,967	552	0	5,519	8,270
1991	4,590	683	5,273	4,184	126	215	4,525	9,798
1992	5,702	1,039	6,741	3,741	111	383	4,235	10,976
1993	5,942	1,117	7,059	3,668	109	408	4,185	11,244
1994	3,175	n.a.	3,175	3,252	114	708	4,074	7,249
1995	2,726	n.a.	2,726	3,927	99	526	4,552	7,278

California landings did not begin until 1970.
Hawaiian landings did not begin until 1987.

Sources: ICCAT, *Collective Volume of Scientific Papers,* Volume XLIV (3), 1994 SCRS, Madrid, Spain, 1995, pp.58 and 61 and ICCAT, Report of the Standing Committee on Research and Statistics, Fourteenth Regular Meeting of the Commission, Madrid, November 10-17, 1995, COM/95/25, Madrid, 1995, data for 1994 (and some modifications for earlier years).
David Holts, personal communication. National Marine Fisheries Service, NOAA, Southwest Fisheries Science Center, 1997.
Russell Y. Ito. 1996. *Annual Report of the 1995 Hawaii-based Longline Fishery*. NOAA. NMFS. Southwest Fisheries Center. Honolulu, Hawaii.

Table 11. UNITED STATES--Landings of swordfish by commercial fishermen, in the Atlantic region, 1960-1995

Year	Longline	Other gear	Total	Year	Longline	Other gear	Total
	Metric Tons				*Metric Tons*		
1960	0	458	458	1978	3,020	664	3,684
1961	0	408	408	1979	3,888	731	4,619
1962	65	359	424	1980	5,015	610	5,625
1963	1,053	197	1,250	1981	3,986	544	4,530
1964	1,279	105	1,384	1982	5,271	139	5,410
1965	945	282	1,227	1983	4,510	310	4,820
1966	534	80	614	1984	4,666	83	4,749
1967	340	134	474	1985	4,642	63	4,705
1968	180	94	274	1986	5,143	67	5,210
1969	93	77	170	1987	5,164	83	5,247
1970	0	287	287	1988	6,020	151	6,171
1971	0	35	35	1989	5,855	556	6,411
1972	0	246	246	1990	4,967	552	5,519
1973	0	406	406	1991	4,184	126	4,310
1974	0	1,125	1,125	1992	3,741	111	3,852
1975	0	1,700	1,700	1993	3,668	109	3,777
1976	0	1,429	1,429	1994	3,252	114	3,366
1977	0	912	912	1995	3,602	100	3,702

Other gear includes harpoon, rod and reel, and driftnets.
In the years 1991-1995, the U.S. also had discards from the longline fishery (215 tons, 383 tons, 408 tons, 708 tons, and 849 tons, respectively).

Source: ICCAT. 1995. Background Document for the 1994 Atlantic Swordfish Stock Assessment carried out by the ICCAT Standing Committee on Research and Statistics (Madrid, Spain - October 19 to 26, 1994). SCRS/94/SWO. *Collective Volume of Scientific Papers,* Vol. XLIV (3), pp. 34-108.

Source for 1994 and 1995 data: National Marine Fisheries Service. 1996. *National Report of the United States: 1996.* ICCAT Working Document. SCRS/96/156[rev].

Table 12. UNITED STATES--Estimated number of swordfish landed by commercial fishermen in the Atlantic region, 1978-1993

Year	Number of fish < 125 cm fl	Number of fish > 125 cm fl	Total number landed	Percent fish landed < 125 cm fl
1978	3,644	49,582	53,226	7
1979	11,057	59,104	70,161	16
1980	25,839	83,130	108,969	24
1981	14,494	63,786	78,281	19
1982	25,611	76,995	102,606	25
1983	28,208	66,155	94,363	30
1984	31,776	74,109	105,885	30
1985	31,007	73,815	104,822	30
1986	42,492	86,290	128,783	33
1987	51,619	87,877	139,496	37
1988	61,997	109,075	171,072	36
1989	66,010	108,878	174,888	38
1990	47,316	96,811	143,127	32
1991	21,518	77,173	98,691	22
1992	5,437	72,316	77,753	7
1993	4,326	72,336	76,662	6

Source: ICCAT, *Report for biennial period, 1994-95,* Part I (1994) Vol. 2.

Table 13 --UNITED STATES. estimated number of swordfish discarded by U.S. commercial fishermen in the Atlantic region, 1991-1993

Year	Number < 125 cm fl	Number > 125 cm fl	Total Number	Percent < 125 cm fl
1991	14,055	1,440	15,494	91
1992	21,647	3,705	25,352	85
1993	24,716	3,349	28,065	88

Source: ICCAT, *Report for biennial period, 1994-95,* Part I (1994) Vol. 2.

Table 14.-- UNITED STATES. Landings by the California swordfish fleet, 1970-93

Year	Harpoon	Driftnet	Other	Total
	Metric Tons			
1970	422	0	7	429
1971	68	0	2	70
1972	118	0	3	121
1973	275	0	3	278
1974	280	0	15	295
1975	384	0	9	393
1976	29	0	9	38
1977	219	0	13	232
1978	1,172	0	9	1,181
1979	227	0	39	266
1980	390	110	43	543
1981	179	320	19	518
1982	108	630	24	762
1983	40	922	220	1,182
1984	73	1,489	451	2,013
1985	145	1,659	558	2,362
1986	163	1,169	417	1,749
1987	145	896	205	1,246
1988	124	759	246	1,129
1989	37	730	529	1,296
1990	35	717	99	851
1991	11	578	94	683
1992	44	899	96	1,039
1993	116	905	96	1,117

Source: David Holts, personal communication. National Marine Fisheries Service, NOAA, Southwest Fisheries Science Center, April 1997.

Table 15. UNITED STATES--Landings by the Hawaiian longline fleet, 1987-1996.

Year	Total weight
	Metric Tons
1987	23
1988	23
1989	281
1990	1,900
1991	4,590
1992	5,702
1993	5,942
1994	3,175
1995	2,726
1996	2,504

Source: Russell Ito, personal communication. NOAA, NMFS, Southwest Fisheries Center, Honolulu, Hawaii.

Table 16. UNITED STATES--Mean weight of Hawaii-based longline catch, 1987-1996

Year	Mean Weight
	(kg)
1987	58.7
1988	54.1
1989	59.5
1990	67.0
1991	70.4
1992	80.6
1993	78.1
1994	73.8
1995	77.6
1996	71.3

Source: Russell Ito, personal communication. NOAA, NMFS, Southwest Fisheries Center, Honolulu, HI.

Table 17. UNITED STATES--Imports of swordfish, 1975-96.

YEAR	IMPORTS
	Kilograms
1975	11,558
1976	32,450
1977	79,753
1978	161,398
1979	157,427
1980	216,631
1981	580,668
1982	549,615
1983	648,787
1984	1,240,396
1985	4,114,675
1986	5,428,595
1987	4,066,840
1988	4,006,982
1989	6,813,093
1990	7,475,609
1991	7,170,861
1992	6,882,581
1993	5,838,149
1994	4,379,120
1995	4,681,267
1996	5,139,596

Source: U.S. Bureau of the Census.

Table 18. UNITED STATES--Imports of fresh and frozen swordfish, by country, 1995.

COUNTRY	FRESH		FROZEN		TOTAL	
	Quantity	Value	Quantity	Value	Quantity	Value
	Kilograms	*US Dollar*	*Kilograms*	*US Dollar*	*Kilograms*	*US Dollar*
Canada	1,258,358	$12,074,444	0	$0	1,258,358	$12,074,444
Chile	1,087,872	$8,352,438	1,455	$13,077	1,089,327	$8,365,515
Trinidad & Tobago	417,418	$2,319,482	0	$0	417,418	$2,319,482
Mexico	335,840	$1,545,922	0	$0	335,840	$1,545,922
Japan	0	$0	139,970	$1,362,874	139,970	$1,362,874
Uruguay	297,906	$1,051,638	0	$0	297,906	$1,051,638
South Africa	0	$0	159,014	$887,189	159,014	$887,189
Fiji	212,991	$777,925	0	$0	212,991	$777,925
Brazil	227,301	$752,305	454	$2,500	227,755	$754,805
Portugal	58,421	$511,123	768	$3,072	59,189	$514,195
Ecuador	80,232	$347,729	0	$0	80,232	$347,729
Singapore	0	$0	52,355	$329,840	52,355	$329,840
Barbados	63,288	$317,626	0	$0	63,288	$317,626
Venezuela	89,837	$314,427	0	$0	89,837	$314,427
Taiwan	0	$0	57,179	$244,545	57,179	$244,545
Costa Rica	27,311	$176,692	0	$0	27,311	$176,692
Antigua & Barbuda	18,188	$159,654	0	$0	18,188	$159,654
China	0	$0	45,922	$98,838	45,922	$98,838
Thailand	0	$0	11,716	$65,058	11,716	$65,058
Indonesia	0	$0	6,689	$37,662	6,689	$37,662
Taiwan	5,861	$36,988	0	$0	5,861	$36,988
New Zealand	6,794	$32,920	0	$0	6,794	$32,920
France	2,581	$28,448	0	$0	2,581	$28,448
Sri Lanka	1,800	$21,191	0	$0	1,800	$21,191
Paraguay	3,337	$11,273	0	$0	3,337	$11,273

Marshall Islands	1,139	$5,765	0	$0	1,139	$5,765
Iceland	3,809	$5,191	0	$0	3,809	$5,191
South Korea	0	$0	1,702	$4,790	1,702	$4,790
Fed. States of Micronesia	1,348	$4,363	0	$0	1,348	$4,363
Australia	875	$4,065	0	$0	875	$4,065
St. Vincent & Grenadine	537	$3,884	0	$0	537	$3,884
Greece	670	$3,494	0	$0	670	$3,494
Finland	329	$1,609	0	$0	329	$1,609
TOTAL	4,204,043	$28,860,596	477,224	$3,049,445	4,681,267	$31,910,041

U.S. Bureau of the Census.

Table 19. UNITED STATES--Imports of fresh and frozen swordfish, 1996.

COUNTRY	PRODUCT FORM		TOTAL
	Fresh	Frozen	
	Kilograms		
Chile	855,648	0	855,648
Costa Rica	709,080	0	709,080
Brazil	550,231	13,235	563,466
Canada	532,656	0	532,656
Uruguay	479,519	0	479,519
Mexico	343,876	27,616	371,492
Trinidad & Tobago	324,638	0	324,638
Singapore	1,119	223,671	224,790
Ecuador	213,134	714	213,848
Taiwan	153,031	44,928	197,959
Venezuela	190,357	0	190,357
Fiji	114,052	0	114,052
Australia	94,635	0	94,635
Japan	0	75,933	75,933
Malaysia	58,847	0	58,847
Barbados	41,403	0	41,403
New Zealand	31,464	0	31,464
Spain	312	13,326	13,638
Netherlands Antilles	12,100	0	12,100
Indonesia	6,385	4,695	11,080
Portugal	5,581	0	5,581
St. Vincent & Grenadine	5,465	0	5,465
Cook Islands	7,319	0	7,319
Greece	1,607	0	1,607

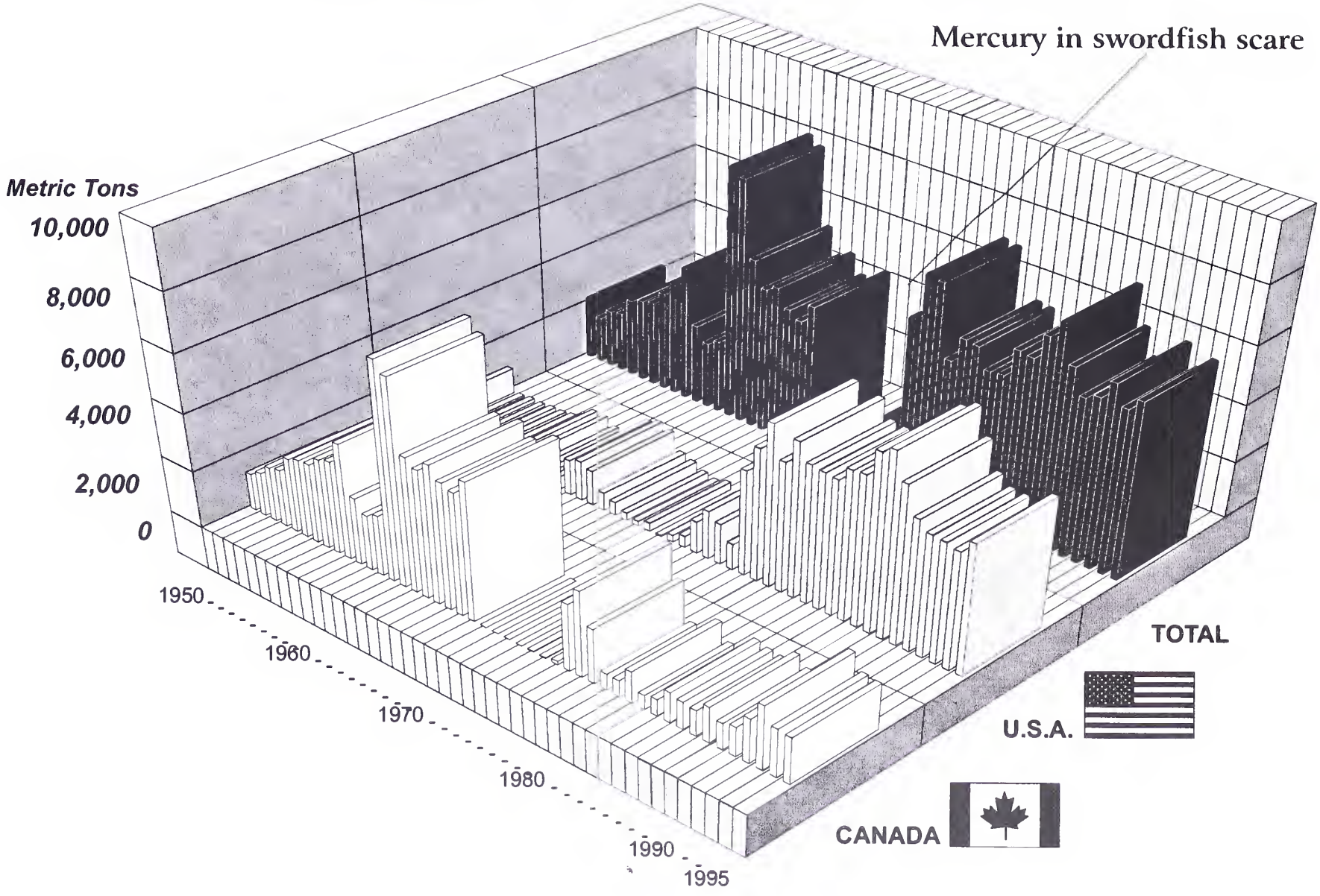
Nicaragua	1,291	0	1,291
France	918	0	918
Peru	441	0	441
Tonga	242	0	242
Grenada	127	0	127
TOTAL	4,735,478	404,118	5,139,596

Source: U.S. Bureau of the Census.

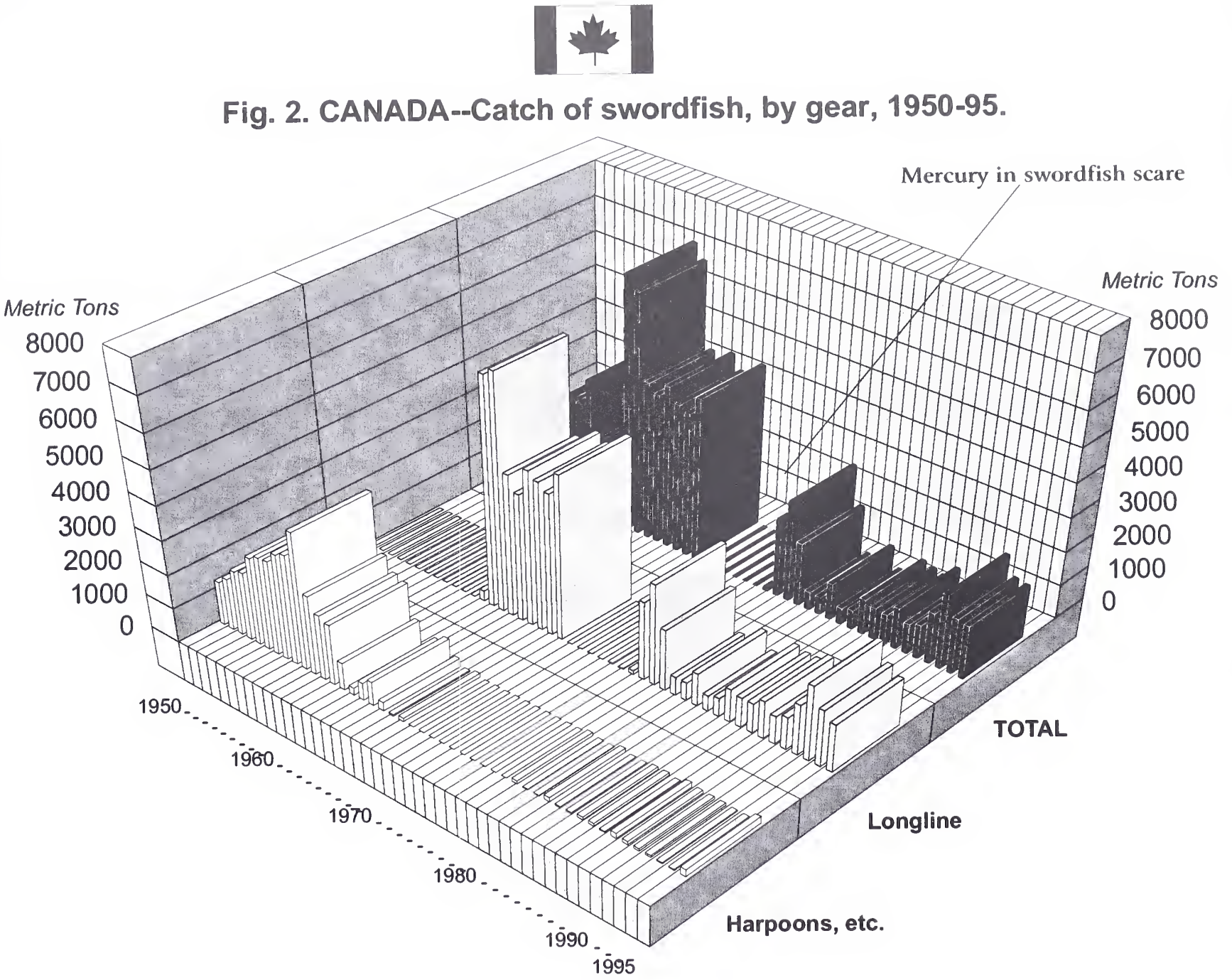
APPENDIX SECTION

PART II. GRAPHICS

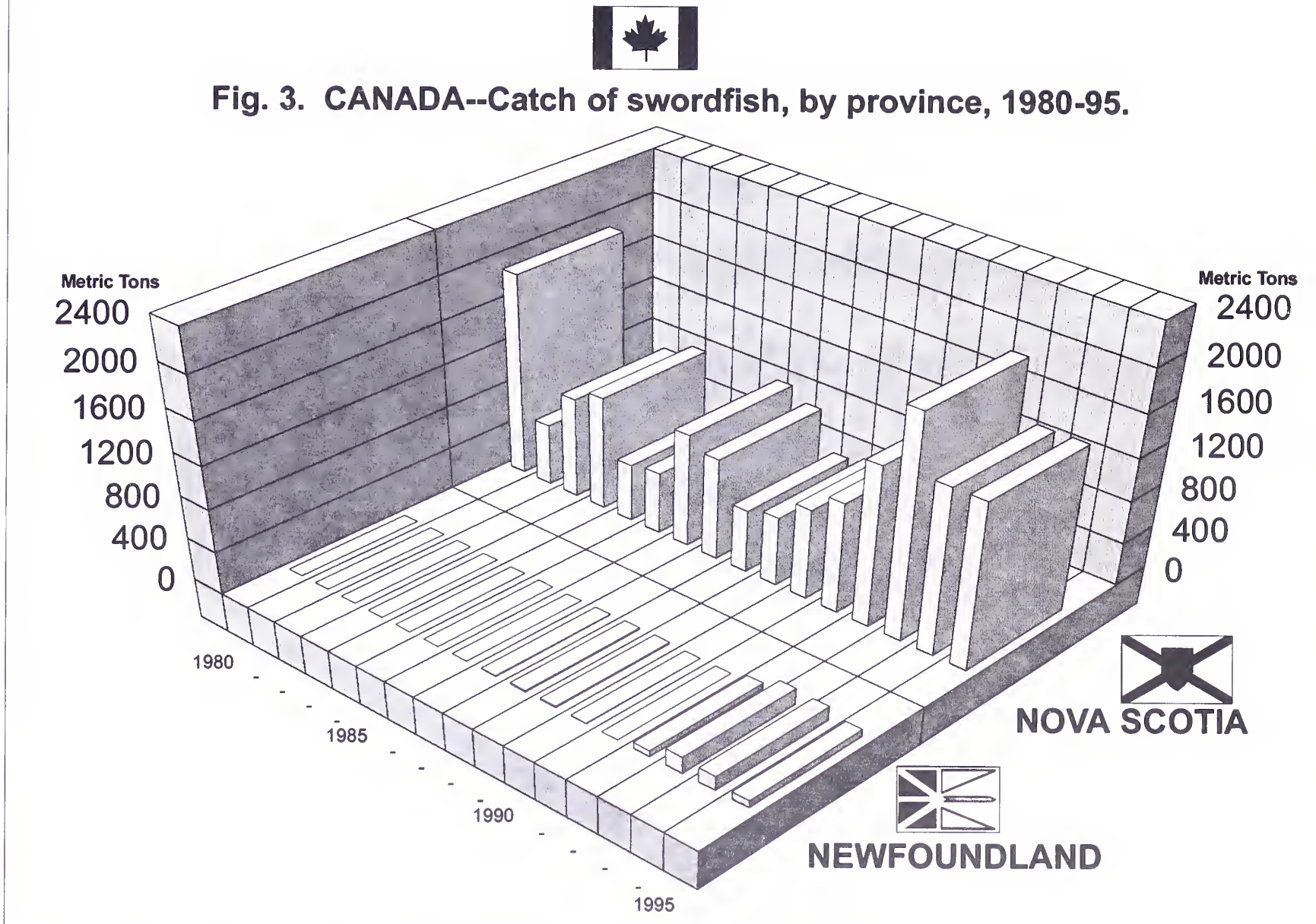
Fig. 1. NORTH AMERICA--Catch of swordfish, 1950-95.



Source: ICCAT, *Report of the Standing Committee on Research and Statistics* (SCRS), Tenth Special Meeting of the Commission, San Sebastian, Spain, November 22 to 29, 1996, COM/06/26, Madrid, Spain, 1996 and FAO, unpublished report.

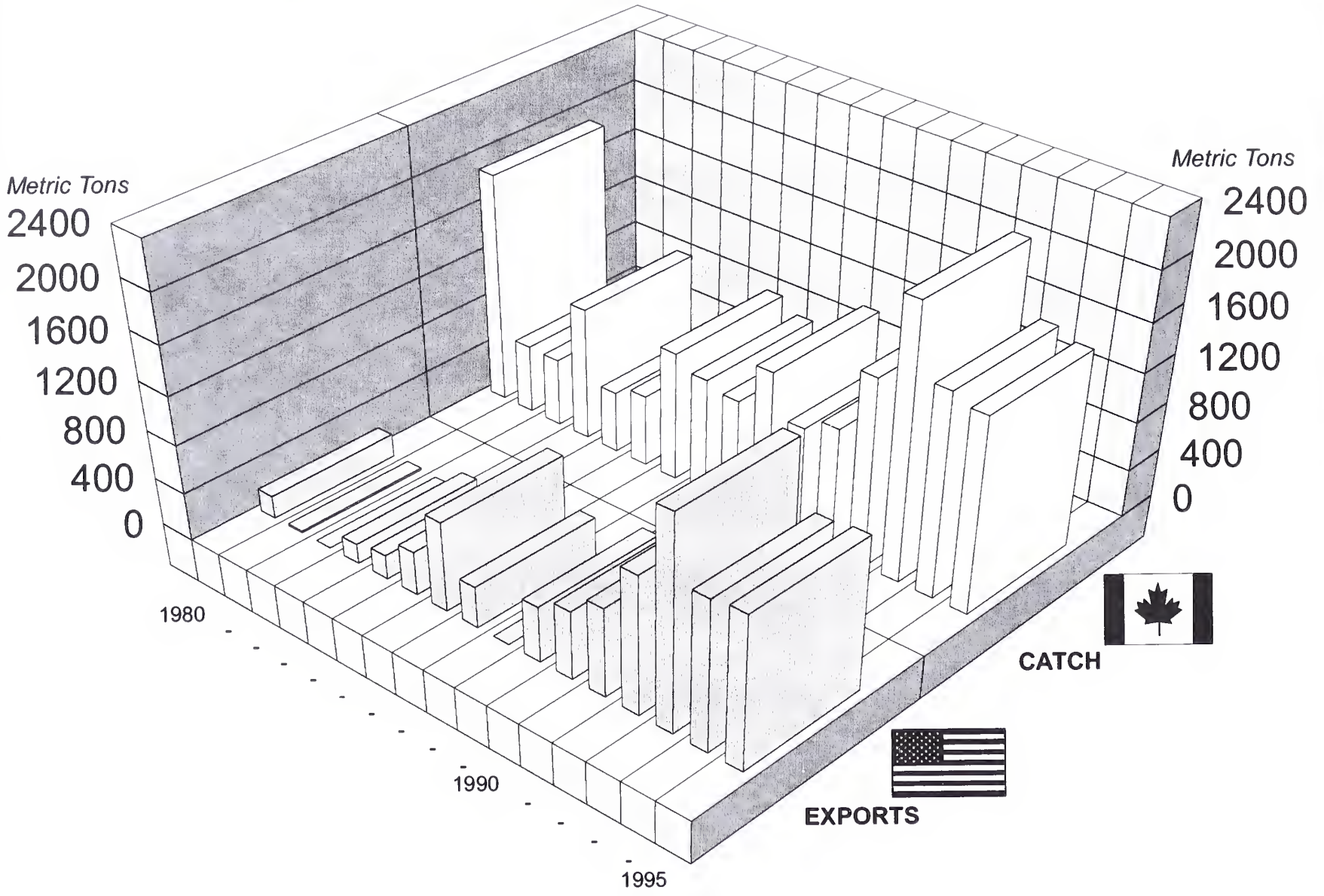


Source: ICCAT, *Report of the Standing Committee on Research and Statistics* (SCRS), Tenth Special Meeting of the Commission, San Sebastian, Spain, November 22 to 29, 1996, COM/06/26, Madrid, Spain, 1996 and FAO, unpublished report.

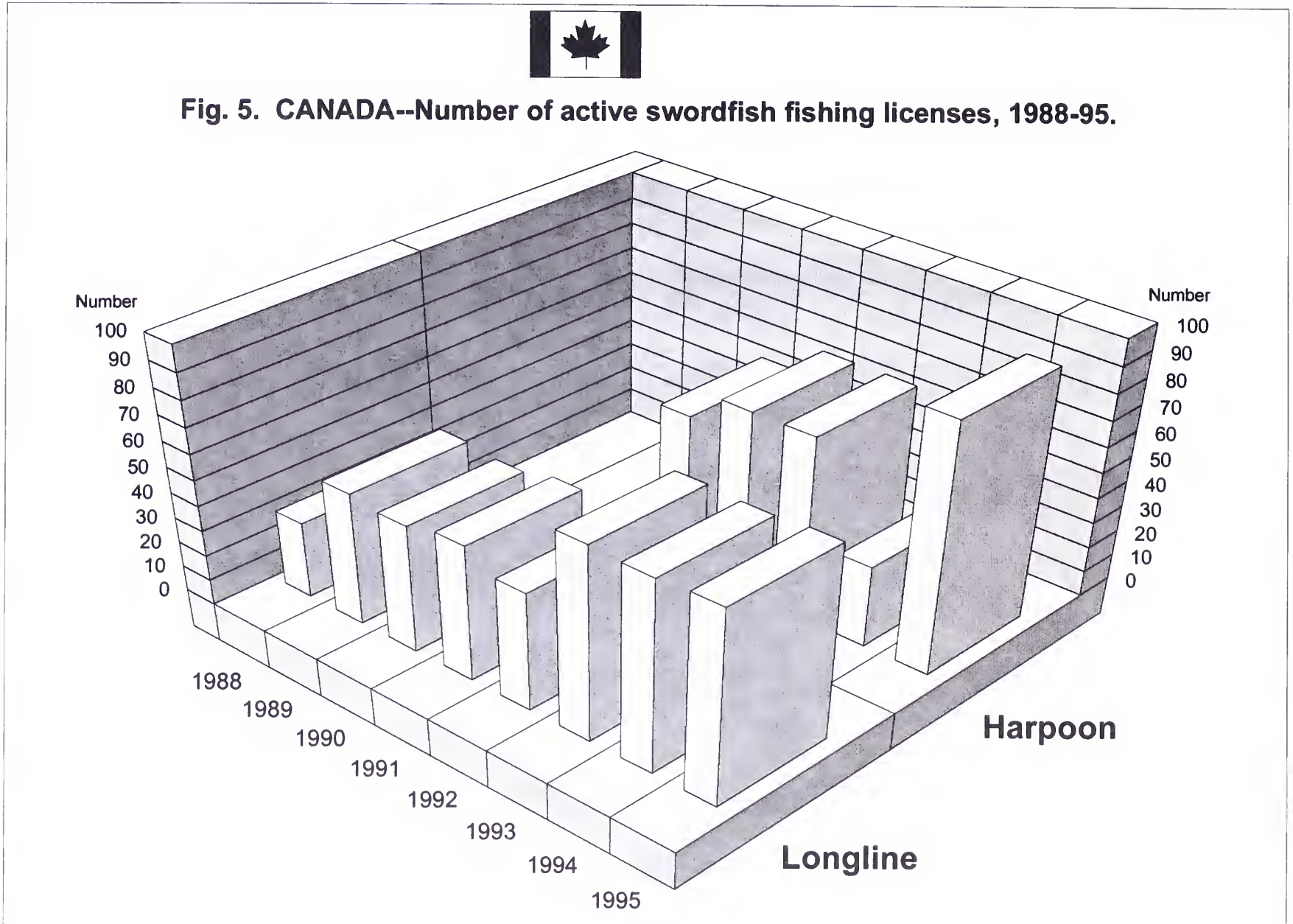


Fisheries and Oceans, Canadian Fisheries International Trade and Canadian Fisheries Annual Staistical Review, Economic Analysis and Statistics Division, Ottawa, Canada, various years.

Fig. 4. CANADA--Exports of fresh swordfish to the United States, compared with total swordfish landings, 1980-95.

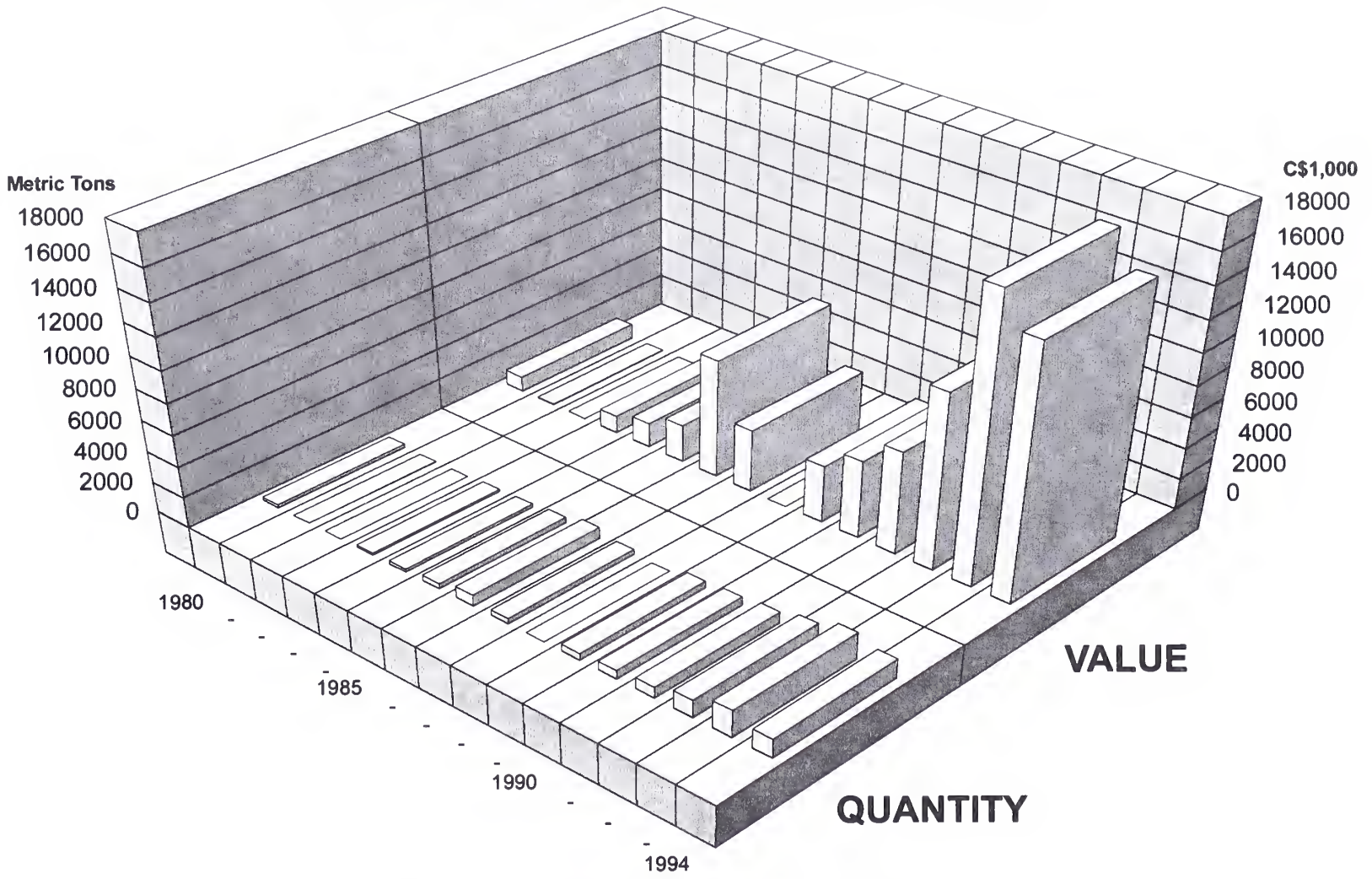


Source: Fisheries and Oceans, *Canadian Fisheries International Trade, Dec*ember 1990-94, Vol. 12, No. 12, Economic Analysis & Statistics Division, Ottawa, Canada.



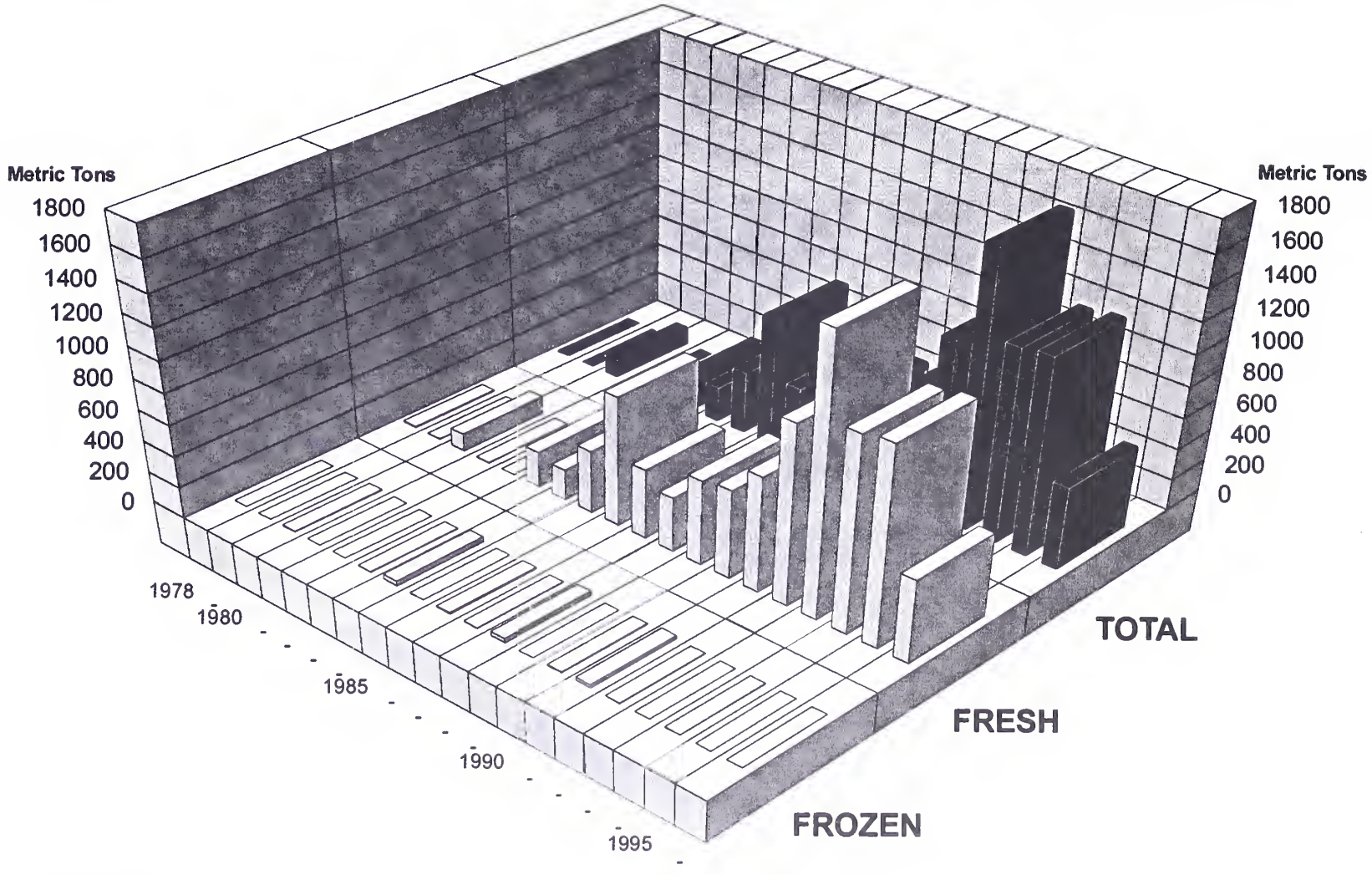
Julie M. Porter, "National Report of Canada," ICCAT, National Reports, COM/95/33, Madrid, 1995 and personal communications (1995 update).

Fig. 6. CANADA--Exports of swordfish, 1980-94.



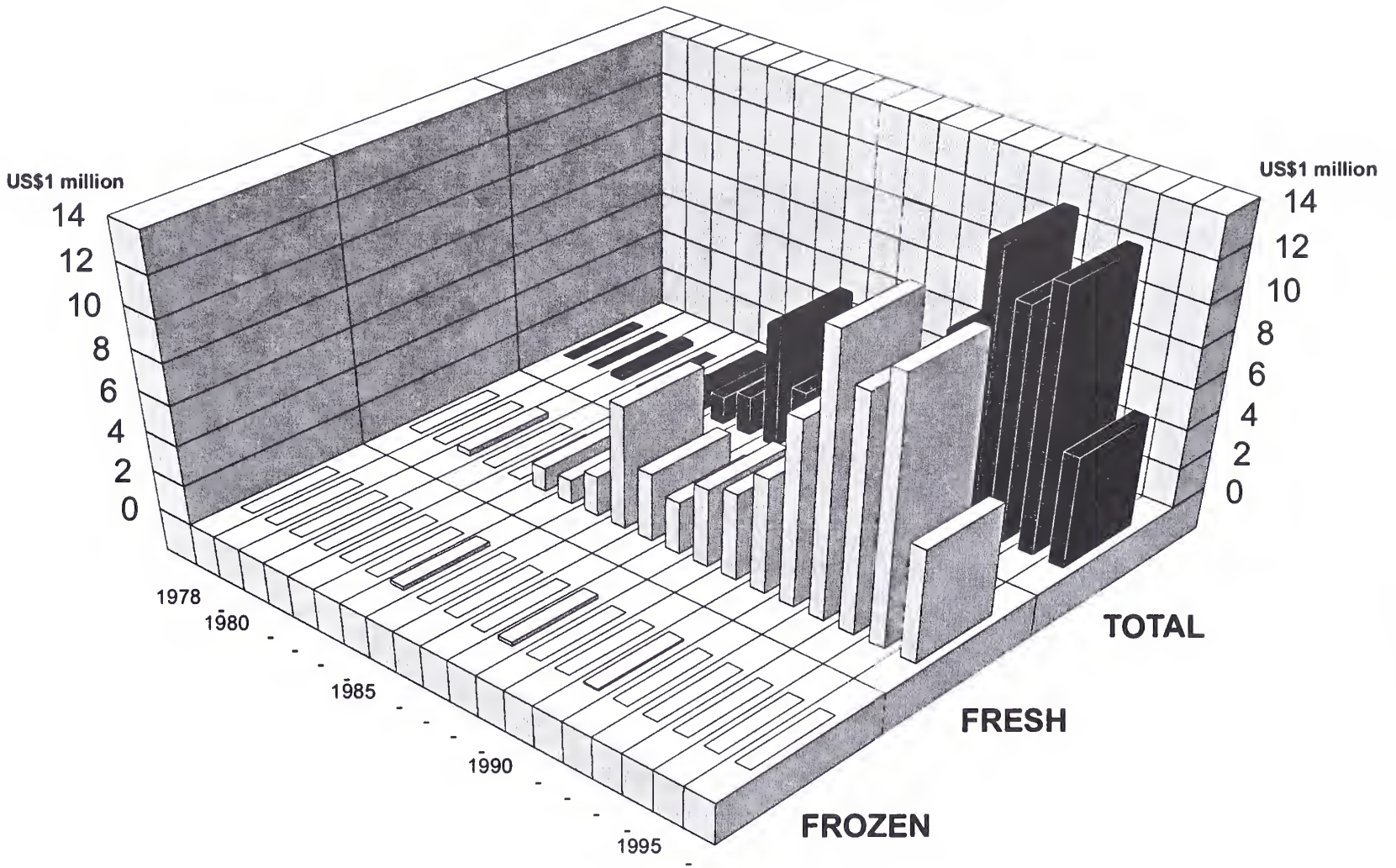
Fisheries and Oceans, Canadian Fisheries International Trade and Canadian Fisheries Annual Staistical Review, Economic Analysis and Statistics Division, Ottawa, Canada, various years.

Fig. 7. UNITED STATES--Imports of swordfish from Canada, by quantity, 1978-96.

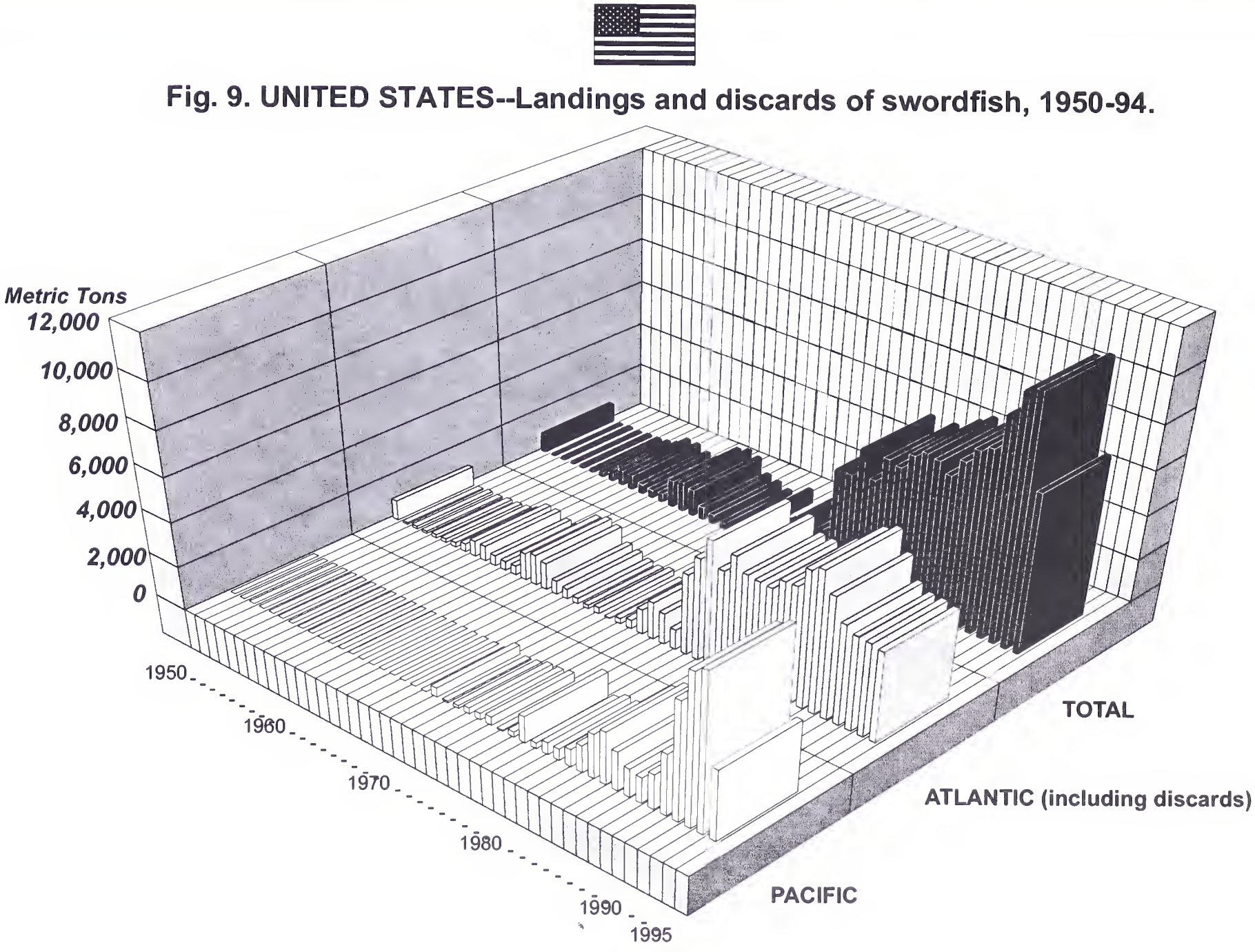


U.S. Bureau of the Census

Fig. 8. UNITED STATES--Imports of swordfish from Canada, by value, 1978-96.

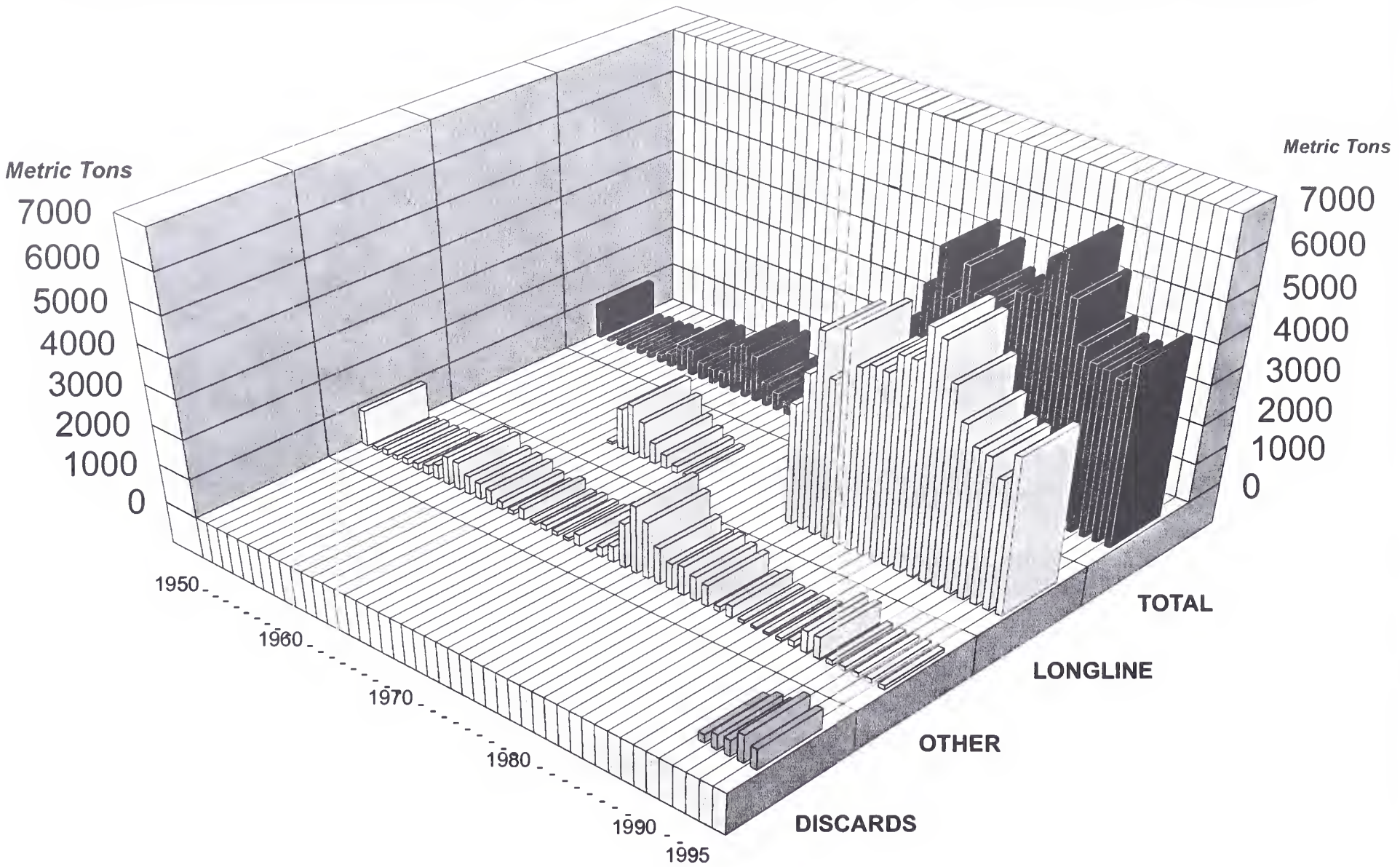


U.S. Bureau of the Census



Source: ICCAT, *Report of the Standing Committee on Research and Statistics* (SCRS), Tenth Special Meeting of the Commission, San Sebastian, Spain, November 22 to 29, 1996, COM/06/26, Madrid, Spain, 1996 and FAO, unpublished report.

Fig. 10. UNITED STATES--Catch of swordfish in the Atlantic Ocean, by gear, 1950-95.



Source: ICCAT, *Report of the Standing Committee on Research and Statistics* (SCRS), Tenth Special Meeting of the Commission, San Sebastian, Spain, November 22 to 29, 1996, COM/06/26, Madrid, Spain, 1996 and FAO, unpublished report.

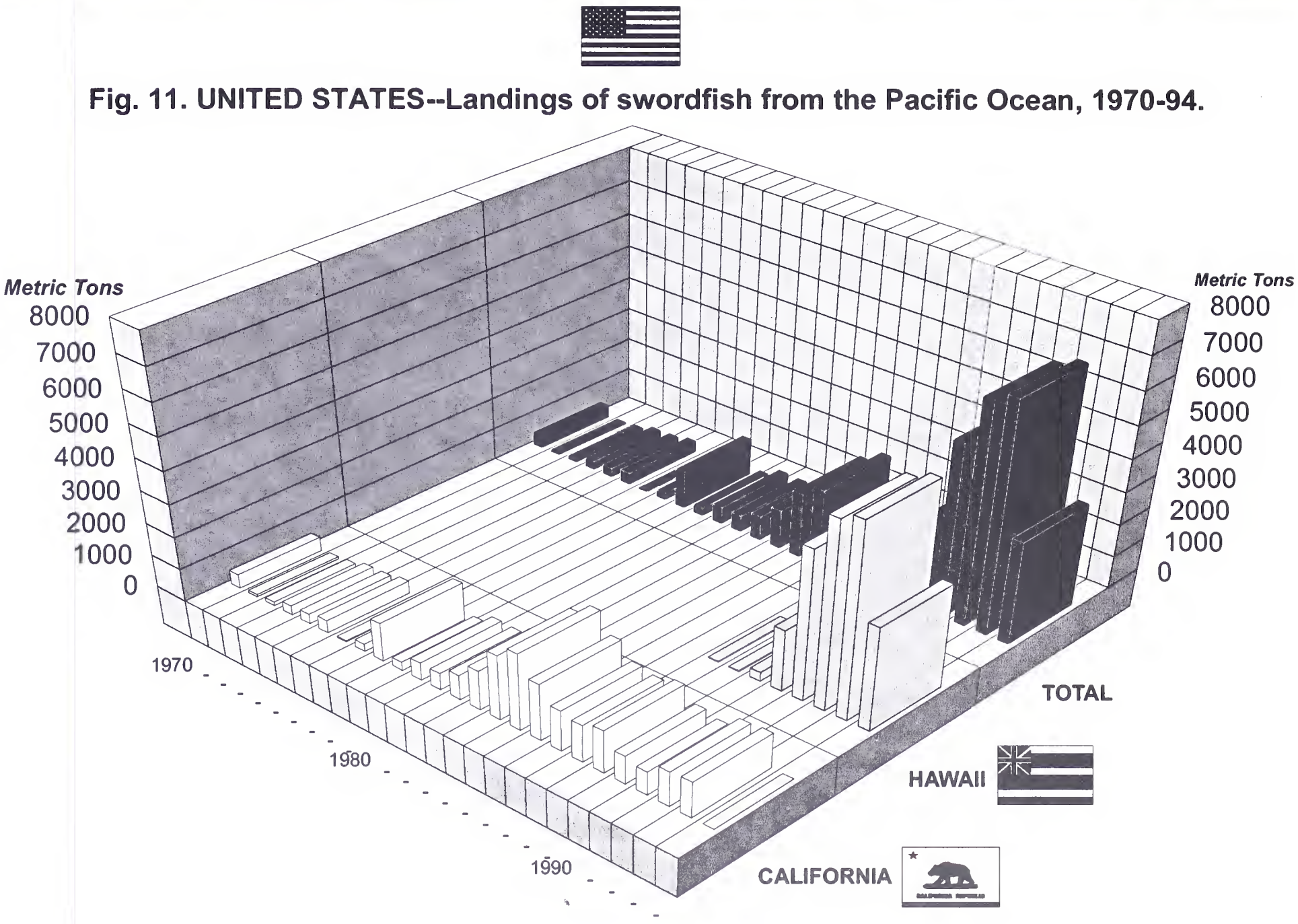
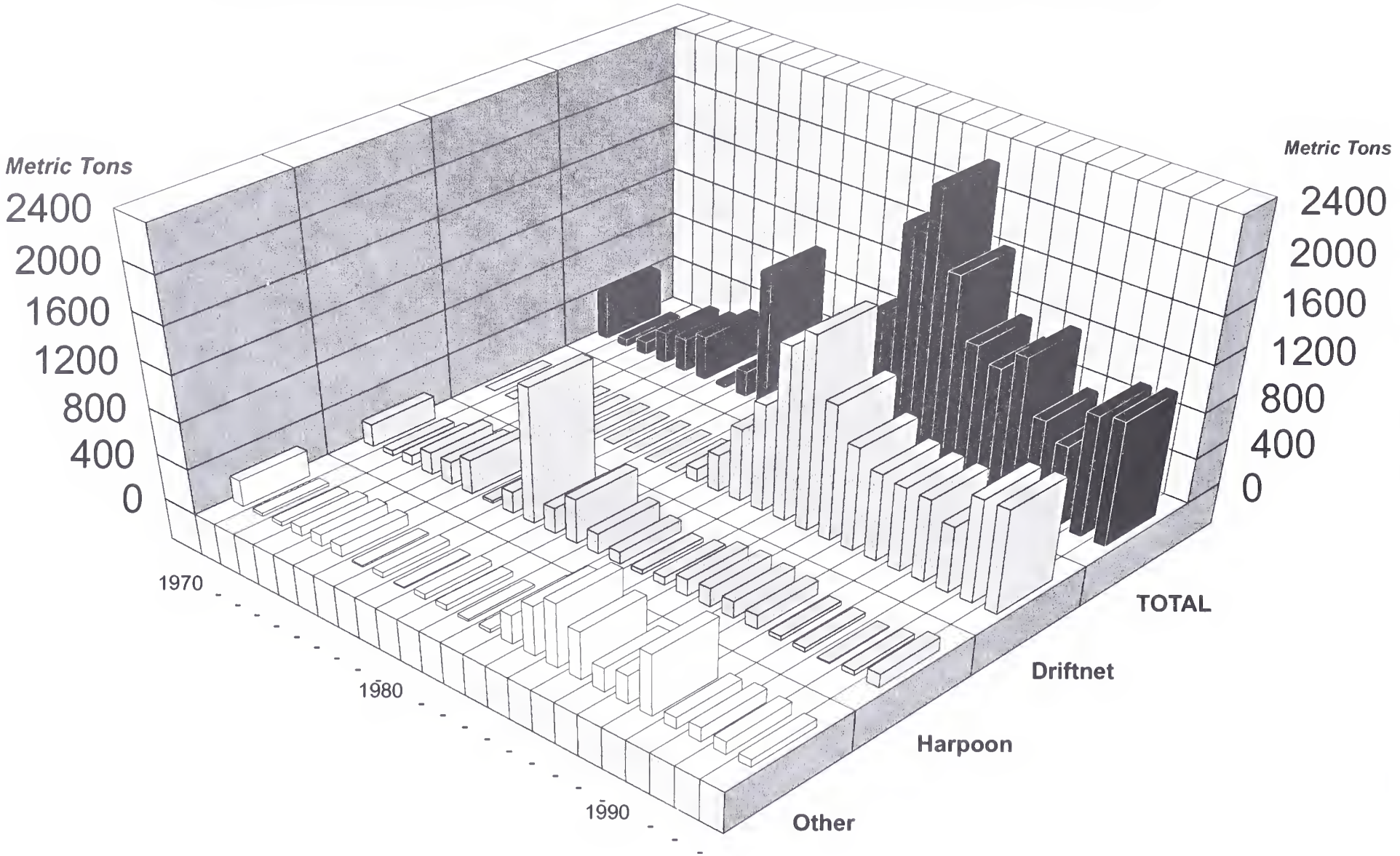


Fig. 11. UNITED STATES--Landings of swordfish from the Pacific Ocean, 1970-94.
Metric Tons
8000
7000
6000
5000
4000
3000
2000
1000
0
1970
1980
1990
Metric Tons
8000
7000
6000
5000
4000
3000
2000
1000
0
TOTAL
HAWAII
CALIFORNIA

Fig. 12. CALIFORNIA--Landings of swordfish, by gear, 1970-93.



Source: David Holts, National Marine Fisheries Service, NOAA, U.S. Department of Commerce, Southwest Fisheries Science Center, August 1996.

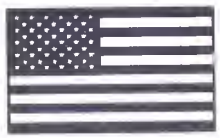
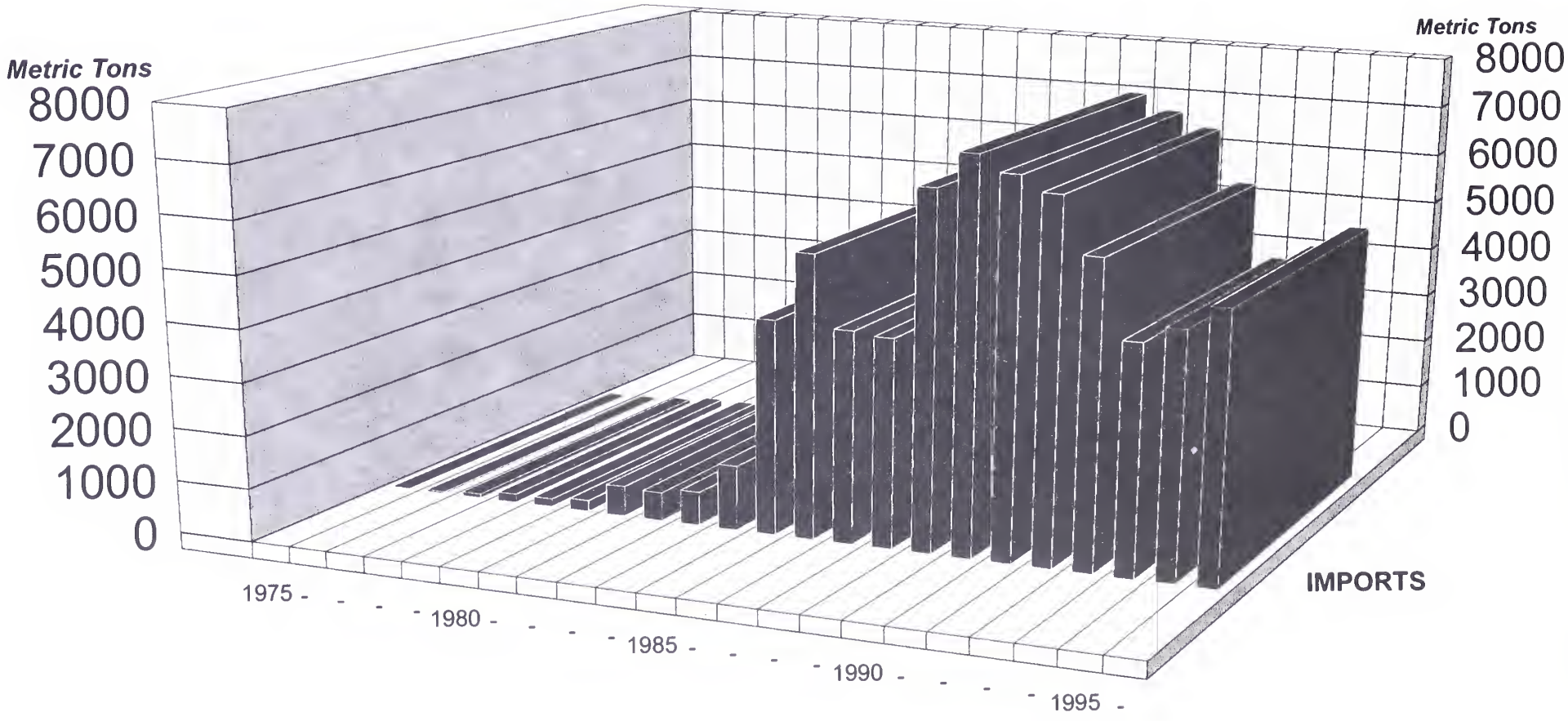


Fig. 13. UNITED STATES--Imports of swordfish, by quantity, 1975-96.



Source: U.S. Bureau of the Census

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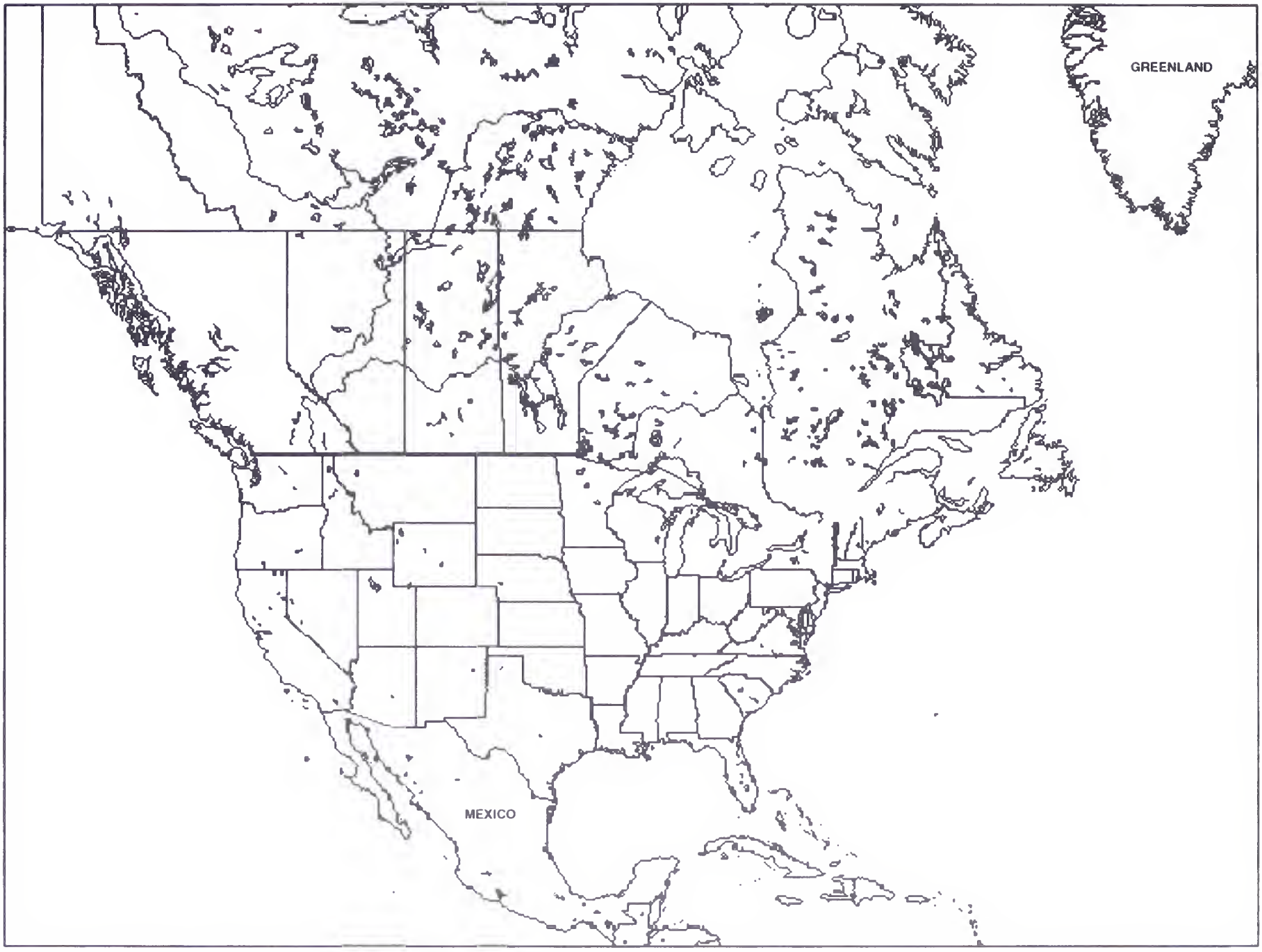
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PART V. ENDNOTES

ENDNOTES

OVERVIEW:

1. Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy, 1996. Catch data for 1995 is based on an unpublished FAO report. The National Marine Fisheries Service (NMFS) reports a higher figure. NMFS statistics reflect landings of 2,726 tons in Hawaii and 4,552 tons in the Atlantic Ocean, for a total of 7,273 tons. NMFS does not have landing data for the coast of California for 1995.

2. NMFS, *Fisheries of the United States, 1995*, Current Fishery Statistics, No. 9500, NOAA, U.S. Department of Commerce, Silver Spring, MD, July 1996, p. 2 and p. 44.

3. Dale M. Crory, U.S. Consulate General, Halifax, Nova Scotia, E-Mail message, December 20, 1995.

CANADA:

4. The specific areas appearing on all swordfish licenses are: "Valid for NAFO Convention Subareas 3, 4 and 5 only, excluding Fishing Zone 1 and 2 of Canada" (Gulf of St. Lawrence and Bay of Fundy). Julie M. Porter, "National Report of Canada," International Commission for the Conservation of Atlantic Tunas (ICCAT), *Report for biennial period, 1992-93*, Part I (1992), English version, Madrid, Spain, 1993, pp. 342. See also A.H. Leim and W.B. Scott, *Fishes of the Atlantic Coast of Canada*, Fisheries Research Board of Canada, Ottawa, 1966, p. 296.

5. Julie M. Porter, personal communications with the author.

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7. Julie M. Porter, *Op.Cit.*, pp. 343.

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11. A.H. Leim and W.B. Scott, *Op.Cit.*, p. 296.

12. Dale M. Crory, U.S. Consulate General, Halifax, Nova Scotia, E-Mail message, December 20, 1995.

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18. Canadian fishermen contend that the U.S. levels of mercury are set incorrectly. The U.S. sets the level as a total allowable amount of mercury per fish, not per pound. This means that large fish -- those mostly taken by harpoons -- are excluded from the U.S. market because large fish have higher amounts of mercury in their flesh. Dale M. Crory, *Op.Cit.*

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29. U.S. Bureau of the Census data.

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32. *Ibid,* p. 23.

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34. EUROSTAT data reports 6 tons of fresh swordfish worth $62,000 and 3 tons of frozen swordfish worth $6,000 for 1991.

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50. *Ibid*, p. B-12.

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61. Dale M. Crory, December 20, 1995, *Op.Cit.*

62. Dale M. Crory, November 24, 1995, *Op.Cit.*

63. Dale M. Crory, November 24, 1995, *Op.Cit.*

GREENLAND:

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UNITED STATES:

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